May 1979 $2.50

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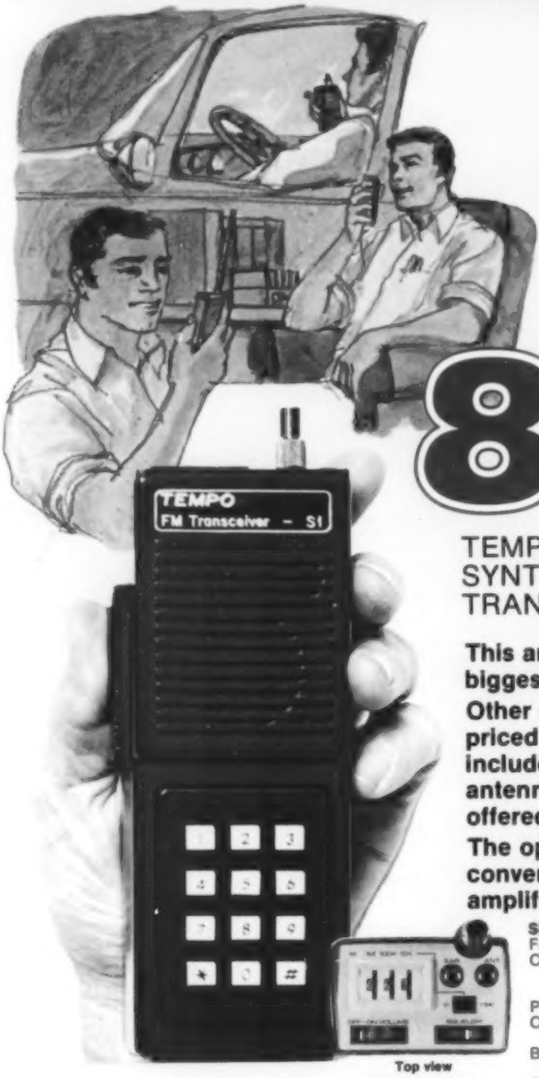
# PORTABLE... MOBILE... BASE STATION



Top view showing controls

*Shown with accessory touch tone pad

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|---|---|
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| Current Drain: | 17 ma-standby<br>500 ma-transmit |
| Batteries: | 8 pieces ni-cad battery included |
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**Henry Radio**

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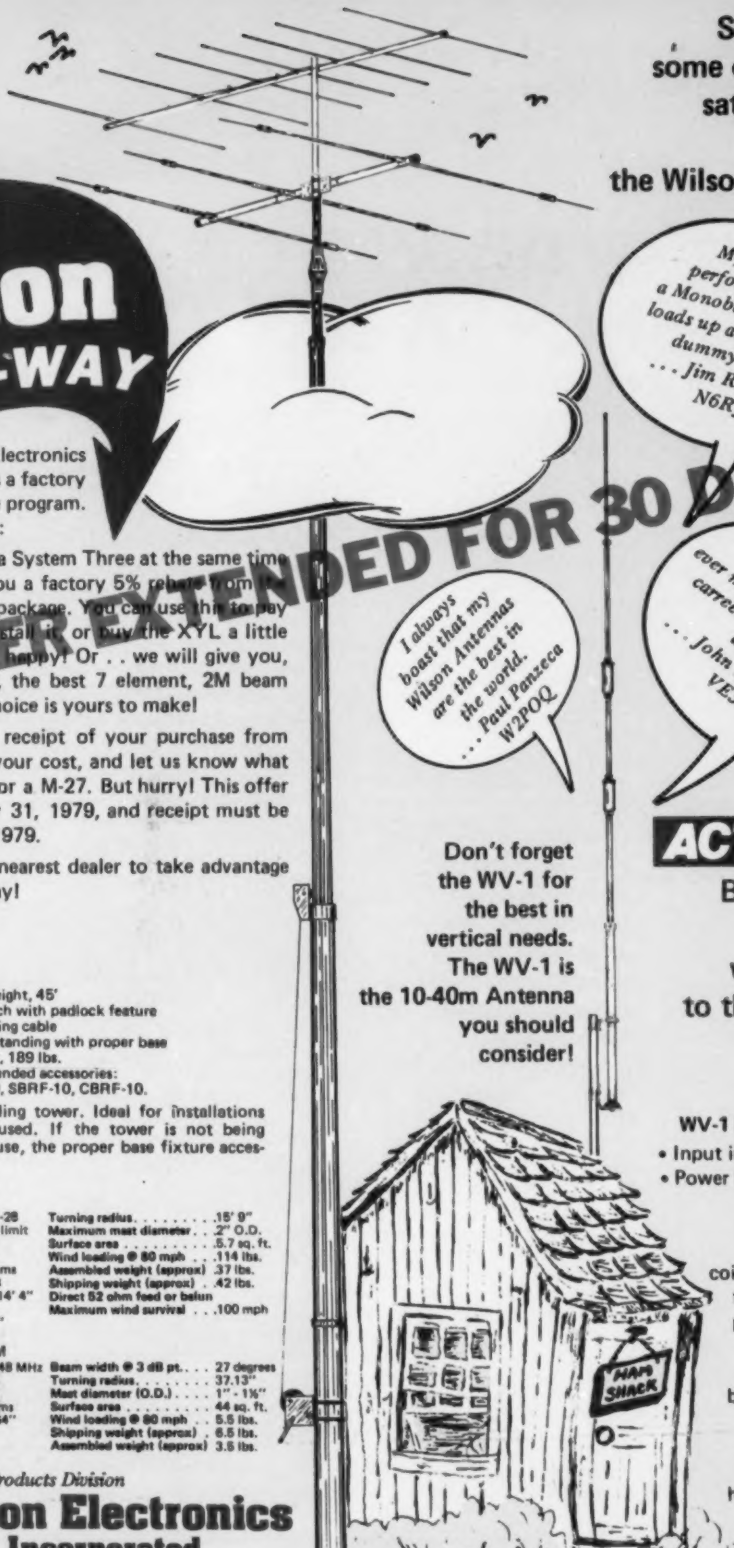
## See what just some of the many satisfied Hams say about the Wilson Antennas.

# THE Wilson GIVE-A-WAY


My Sy-3 performs like a Monobander, and loads up as easy as a dummy load! . . . Jim Rafferty N6RJ
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Best move I've ever made in my Hamming carreer. Tnx for a great antenna! . . . John Sklepkowycz VE3IPR
HAM SHACK

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Just send Wilson the receipt of your purchase from your dealer, showing your cost, and let us know what you want — 5% cash, or a M-27. But hurry! This offer expires midnight, May 31, 1979, and receipt must be mailed before July 1, 1979.

Don't wait! See your nearest dealer to take advantage of this great Give-A-Way!

### SPECIFICATIONS

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- 800 lbs. winch with padlock feature
- 2800 lb. raising cable
- Totally freestanding with proper base
- Total weight, 189 lbs.

Recommended accessories:
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The TT-45 is a freestanding tower. Ideal for installations where guys cannot be used. If the tower is not being supported against the house, the proper base fixture accessory must be selected.

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| | | | |
|---|---|---|---|
| Band MHz | 14-21-28 | Turning radius | 15' 9" |
| Maximum power input | Legal limit | Maximum mast diameter | 2" O.D. |
| Gain (dBd) | 8 dB | Surface area | 5.7 sq. ft. |
| VSWR at resonance | 1.3:1 | Wind loading @ 80 mph | 114 lbs. |
| Impedance | 50 ohms | Assembled weight (approx) | 37 lbs. |
| F/B Ratio | 20 dB | Shipping weight (approx) | 42 lbs. |
| Boom (O.D. x length) | 2" x 14' 4" | Direct 52 ohm feed or balun | |
| No. of elements | 3 | Maximum wind survival | 100 mph |
| Longest element | 27' 4" | | |

#### M-27 - 7 ELEMENT 2M BEAM

| | | | |
|---|---|---|---|
| Band MHz | 144-148 MHz | Beam width @ 3 dB pt. | 27 degrees |
| Gain | 11 dB | Turning radius | 37.13" |
| VSWR | 1.2:1 | Mast diameter (O.D.) | 1" - 1½" |
| Impedance | 50 ohms | Surface area | 44 sq. ft. |
| Boom (O.D. x length) | 1" x 64" | Wind loading @ 80 mph | 5.5 lbs. |
| Number of elements | 7 | Shipping weight (approx) | 6.5 lbs. |
| Longest element | 40" | Assembled weight (approx) | 3.5 lbs. |

Don't forget the WV-1 for the best in vertical needs. The WV-1 is the 10-40m Antenna you should consider!

## ACT NOW!

Buy the WV-1 and Wilson will treat you to the Radial Kit . . . FREE of charge!

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- Input impedance: 50 ohms
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- Two High-Q traps with large diameter coils
- Low angle radiation omnidirectional performance
- Taper swaged aluminum tubing
- Automatic bandswitching
- Mast bracket furnished
- SWR: 1.1:1 on all bands
- 1½" O.D. heavy wall aluminum tubing
- Does not require guying
- Overall length: 19' 8".

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# W2NSD/1
# NEVER SAY DIE
### *editorial by Wayne Green*

### ATLANTA, JUNE 16-17

While June is a very busy month in both the microcomputer and ham businesses, no year would be really complete without a trek to Atlanta for the Atlanta Hamfestival. First, I'll be down to Dallas on June 2-3 and be giving talks at the Dallas hamfest on both computer programming and on the present state of affairs in amateur radio.

My next stop will be New York and the National Computer Convention (IEEE), where I will talk about computer program development and sales. That's June 5-7, if you're in the vicinity.

Atlanta's hamfest has been growing year by year and is starting to give Dayton some worries. There are an awful lot of hams in the southeastern part of the country, and just about every one of them packs up his family and heads for Atlanta come June. Thousands come in from every southern state. It's a madhouse . . . and it's a ball.

Chaz Cone, the chap who has been pulling this event off (not without a lot of able help), has come up with some incredible prizes . . . last year they gave away a car with a complete ham rig installed. There are so many prizes that it is difficult to escape getting something which is worth more than the registration fee.

I'll be there and be giving a couple of talks . . . one on computing, with the emphasis on amateur radio . . . and not a little information on how to get into computing and take advantage of the incredible growth which this field still has ahead of it. Never before have there been so many opportunities to make a fortune . . . if you're willing to work for it. The money is there, waiting for anyone who really wants it.

The other talk will be ham-oriented and will try to put the past, present, and future into perspective. Does Wayne really hate the ARRL, or is this a figment of the imagination foisted on a gullible public by Newington?

What is Wayne really like? Is he the prophet of doom and gloom or is he a pragmatist, calling the shots the way they are? Is Wayne really as rich as some people from Connecticut say he is? And how in the devil did *73 Magazine* get to be the largest in the ham field? Bring your questions, and Wayne will answer them.

In addition to exhibits by most of the top ham equipment firms, you'll find dealers fighting tooth and nail for your business. Many are bringing trailer loads of ham gear to try to sell before the summer slump. There will also be some exciting displays of the latest in personal and small business computers. Maybe it's time for you to get more familiar with these little buggers and integrate one into your ham station . . . and home?

### THOSE TOLL-FREE NUMBERS

A letter from Ed Leviton AB3B points out that the Federal Trade Commission has rather strong rules to protect mail-order buyers, but when you order over the telephone, you forego this protection. The entire text of the mail-order merchandise rules are lengthy and have some strong teeth. A copy can be obtained from the Government Printing Office, CCH booklet #4803, $1.50.

If you are lazy, like me, and prefer to use the phone, then it's caveat emptor (buyer beware).

### ON TOP OF OLD SMOKEY

A recent court case (People v. Case—NY—365NE2d 872, 87ALR3d 77) involved a CBer who reported a radar checkpoint over his radio and was arrested for this. He was convicted in a justice court, and his conviction was upheld in the County Court. It was then reversed by the Court of Appeals. This court held that "under the statute making the obstruction of governmental administration a crime, obstruction must be by means of intimidation, physical force, or interference, or by means of any independently unlawful act and that the defendant's verbal message via his Citizens Band radio did not constitute a physical interference with governmental administration."

Since people seem to worry about that aspect of CB and hamming, I thought you'd like to know and have the reference.

Another lawyer has promised to write and let me know more about a situation which has developed in his area in which hams are virtually exempt from radar-inspired speeding tickets by virtue of the unsettling effects of a two meter rig in the car.

My thanks to Attorney Duncan Kreamer W1GAY for the above reference.

### THE ROVING CAMERA

As if things aren't bad enough in New Hampshire in February (unless you happen to be a skier), the Interstate Repeater Society (I detest the

*Continued on page 116*

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**Kenwood's TS-180S with DFC is an all solid-state HF tranceiver designed for the DXer, the contest operator, and all other Amateurs who enjoy the 160 through 10-meter bands. The following features prove, beyond doubt, that the TS-180S is the classiest rig available!**

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- All solid-state... including the final. No dipping or loading. Just dial up the frequency, peak the drive, and operate!
- High power... 200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters (entire band provided). Also covers more than 50 kHz above and below each band (MARS, WARC, etc.), and receives WWV on 10 MHz.
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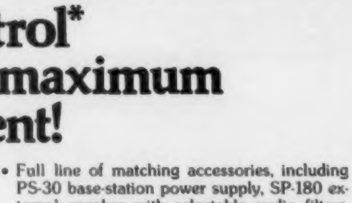
**All of these advanced features can be yours... and at an attractive price! Visit your local Authorized Kenwood Dealer and inquire about the exciting TS-180S with DFC!**



**Still available... Kenwood's TS-820S HF transceiver.**

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# Looking West

*Bill Pasternak WA6ITF*
*24854-C Newhall Ave.*
*Newhall CA 91321*

Having just celebrated my thirty-eighth birthday, and remembering back to my teens and the traumas I went through to obtain my amateur license, I was kind of amazed the other evening when my friend Harvey Ross WB6YNO recounted the story of how his now nine-year-old became General class licensee WD6FLP not long ago. It's an interesting story, and I'd like to share it with you.

I've known Harvey and his wife Bonnie WA6SNB almost from the day we moved to Los Angeles. We first met on the air via the PARC WR6ABB repeater and were later formally introduced by Walt W6EJK. As Harvey tells it, one day close to two years ago he was busy operating 20 CW when his son David asked him to teach him Morse code. After some thought, Harvey not only agreed to do so, but also made a game out of the project. David was fast to catch on, and it was not long before he had mastered the 5 wpm necessary to pass the Novice exam.

To help David with the theory, Harvey enlisted the help of a friend named Bill Ellis. Bill, whose callsign is WA6USB, runs what is possibly the nation's most successful amateur training school: Murphy's Amateur Radio Class, which meets weekly in Culver City, California. At Bill's suggestion, Harvey enrolled David in Murphy's Novice training program; the move was a very successful one. For his eighth birthday, David received quite a present: amateur callsign WD6FLP. Now, many youngsters would be content with attaining a goal such as this and move on to other things. However, in that regard, David is not your average youngster. He had developed a love for amateur radio, and a Novice ticket would just not suffice. He continued working toward his next major goal, a General class license.

In July of 1978, David thought it was time to try. Though he literally breezed through the CW exam, the theory stumped him. He was kind of disappointed—but in no way beaten. Back to the books he went, so that next time the elusive General ticket would be his. His tenacity paid off on December 14, 1978, when he walked out of the FCC office in Long Beach, California, with General class privileges and the ability to sign WD6FLP—interim LB. His first QSO? It happened to be on 450 MHz to inform his very proud father that he had made it!

What does a nine-year-old General do, you ask? The same as any other ham. He operates all bands, belongs to radio clubs, and is probably the youngest person to be found on a remote-base system anywhere. Oh, yes, in his spare time David is hard at work with his younger sister, teaching her code in hopes of making it an all-amateur-radio family.

The case of Scott Lookholder WB6LHB is another matter entirely. We have been following this legal matter since it became public some months ago, and here is the final chapter. On February 6th, Judge Lawrence T. Lydig in Los Angeles Federal District Court passed sentence upon Mr. Lookholder, who had earlier, on January 10th, pleaded guilty to three counts of using foul and abusive language on the air. The sentence broke down as follows: count 1—$500 fine; count 2—$500 fine; count 3—one-year probation. In addition, the court has forbidden Mr. Lookholder to use his amateur privileges for the term of the probation, and, while not making it a mandatory part of probation, the court did suggest that Mr. Lookholder seek psychiatric care. In his closing remarks just prior to the passing of sentence, the court described Mr. Lookholder as "being a disgrace to himself, his family, and the amateur service."

Lookholder's alleged operations as "W6JAM" had raised havoc over a number of Los Angeles area 2 meter repeaters for several months. Particularly hard-hit had been WR6ABN, and it has been thought that many ABN users would be present for the sentencing. Alas, that was not the case. As is usual in amateur circles, apathy dominated the day, with but four area amateurs in attendance. Earlier, when the court was soliciting voluntary written statements from those who had been adversely affected by Mr. Lookholder's operations, only eight area amateurs took the time to write at all. Eight out of close to 20,000! The fact that not even 1% of the total ABN usership (which these days numbers close to 400) took the initiative to express their views to the court when requested is a rather sad commentary on the overall amateur society. Yet, during the "W6JAM Reign Of Terror," hundreds of anti-W6JAM comments could be heard each day. Now, the average on-the-air commentary is to the effect that the court was far too lenient in the case. To those who had their chance to affect the case and were too lazy or apathetic to utilize it, I can only say, "you blew it."

I do not wish to single out the overall ABN usership for admonishment in this matter. Letters from other parts of the nation tell the same story. A jammer is caught, and when it comes to the nitty-gritty of prosecution, everyone suddenly disappears. One or two are left to do the work for many. On-the-air rhetoric against the offender is loud and boisterous, but overall cooperation is nil. Maybe this is the reason for the development of a new kind of interference-tracing and -documentation method, the quiet clandestine operations which simply gather input and develop airtight legal cases. In many areas, it has become obvious that trying to get the assistance of the average "Joe Ham" has become impossible. Sure, he cares, but not enough to get out and T-hunt the offender or even write a letter of complaint. So, in many locations, the small number of people who really are concerned are banding together. Probably you will never know who they are until the time arrives when a major offender is brought to justice. Perhaps not even then. The Lookholder case has proven one thing to many: It has shown that our legal system can and will work if we are prepared to use it. Action taken

*Continued on page 148*

*David Ross WD6FLP.*

*TASMA's 1979 leadership: Chairman Bob Thornburg WB6JPI (left) and Vice-Chairman Dave Ferrone WA6KOS.*

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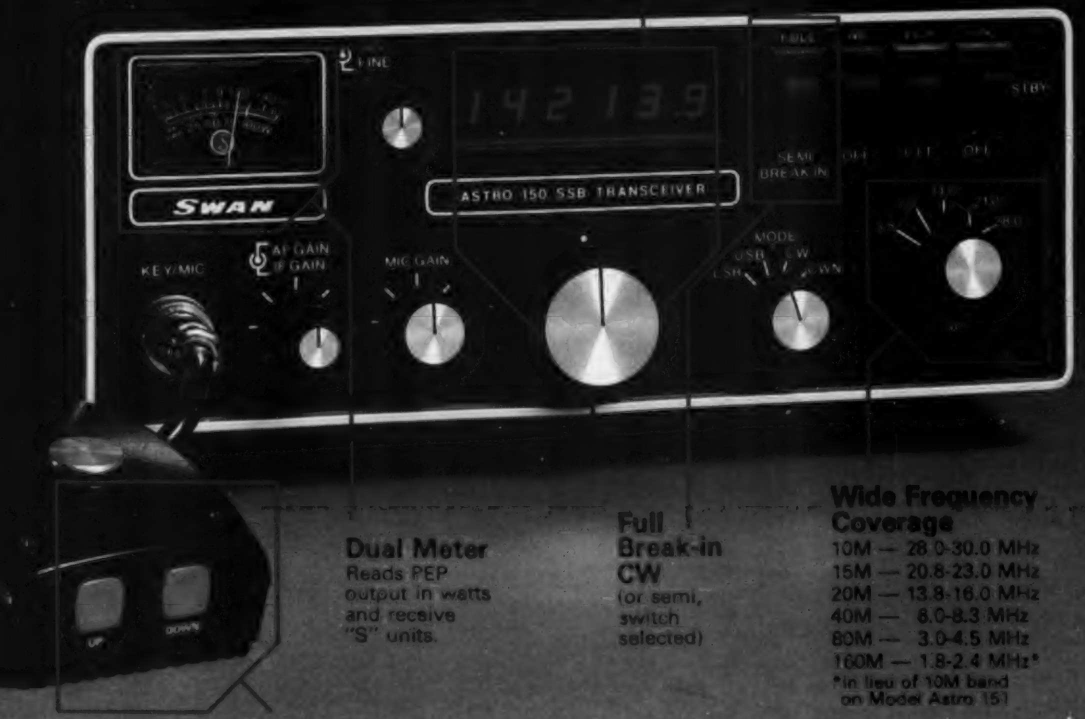

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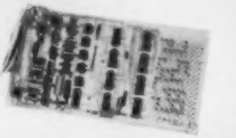

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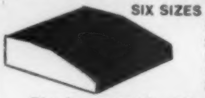

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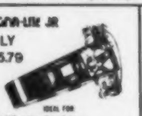

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# DX

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### DX PROFILE

This month's DX Profile is on one of the better-known DXers in the world, Dr. San Hutson K5YY/K5QHS, of Little Rock, Arkansas.

San's ham career began in the mid-1950s when he picked up an old S-38 receiver and started monitoring the ham bands. After receiving a few QSL cards, he decided to get in on the action side of the hobby and applied for his Novice exam. San received his Novice license in 1958, along with the call KN5QHS, and four months later he passed the General class exam. In 1977, San upgraded to Extra class and received his present call, K5YY.

San has always been primarily a DXer, but because of college he missed a few years. During that time, he also missed several now-deleted countries that would have brought his DXCC total to nearly 350. As it is, his total still stands at 333, and he needs only BY and VS9K to have them all.

Due to his medical practice, San has moved around quite a bit since receiving his medical degree from the University of Arkansas in 1969. However, all of his operating has taken place inside the state of Arkansas (with the exception of two years spent in Broken Bow OK).

San's first DXpedition was the only authorized DXpedition to Swan Island. In the eight years since, he has become one of the most traveled amateurs in the country, operating from CE0Z, CE3, ZF1, KS4, VP2D, FM0, FG0, FL8, FH8, D6, ST2, ST0, 3B8, and 5H1, along with F0, I0, and G. San was the first to operate from D6 and the first to activate two new DXCC countries on a solo effort when he operated from D6A and FH8 in 1976.

His DXpedition experiences have made San much in demand as a featured speaker at DX gatherings across the country. He has spoken to the Arkansas DX Association many times, the W9DXCC banquet twice, DXpo, SEDXA in Atlanta, and many others.

A past president of the ADXA and presently head of the Executive Committee, San was recently appointed to the ARRL DX Advisory Committee. He feels this DXAC appointment to be the crowning point in his twenty years of hamming, especially in light of the serious aspects of WARC '79 and present DXCC disgruntlement facing the committee.

Still in his mid-30s, San is the Senior Medical Consultant for Social Security in the state of Arkansas. He is married and the father of three children (aged four, ten, and eleven). Other than amateur radio, his hobbies include sporadic coin collecting (mostly pennies from 1850 on) and Corvettes—he has owned 13 Corvettes in the last 11 years. He enjoys hunting and tries to go deer hunting every year. He also enjoys all sports and, true to the medical profession, he is an avid golfer.

Somewhat of an equipment collector, his present station includes two Signal Ones and a home-brew 4-1000 linear, a Drake C-Line and Alpha linear, a Collins KWM2-A and L4B linear, the Kenwood twins with a two meter hookup, and a 75A4 receiver. Antennas include a Telrex beam for 20, a duobander for 10/15, a sloper for 40, a dipole for 80, and a loop and shunt-fed tower on 160. He says that his first real antenna was a five-element Telrex twenty meter beam at 130 feet, but since moving into larger cities, he has had to compromise somewhat.

*San Hutson K5YY and his station in Little Rock. San says the station changes constantly, but this is it at the moment.*

He hopes some day to have a super station with several operating positions for visiting hams and contests. San likes contest operation on the low bands and has over 60 countries confirmed on 160 meters.

San is planning another DXpedition for later this year and says he will always be planning one of some sort. One of the most interesting aspects of DXpeditions is meeting and getting to know other hams all over the world. On his last trip alone, San met ST2SA, ST2HF, 3B8DA, 3B8DA, 3B8CJ, FH8OM, FH8YL, FH8CJ, D68AD, I0MGM, and many others in Italy, Great Britain, and along the way.

Respected as a DXer around the world, San was the ADXA DXer of the Year in 1973. He also won the Virginia Century Club Award in 1976, the ADXA Achievement Award in 1977, and the Diplome du T.F.A.I. in 1976, and holds certificates for A1 Operator, WAZ, WAC, WAS-160, DXCC Honor Roll—phone and CW—and many more.

San claims that once he works BY and VS9K to have them all, he will just sit back and play with his sports cars. We find that hard to believe. The feeling here is that whenever and wherever there is a new one to be worked, K5YY will be on one end of the pileup or the other.

### HEARD ON THE BANDS

With the recent mutual recognition between the U.S. and China, the feeling among many DXers is that BY stations will soon be blossoming everywhere. Although the chances for a true-blue BY-type operation from downtown Peking are better than they have been in many years, those with inside knowledge believe it may still be a bit premature to expect any immediate action, especially by any visiting U.S. operators.

The operation, when it comes, will most likely develop along the lines of the Iraq activity, where some YUs were able to help the locals develop their skills and form a national radio club. Already, several foreigners working inside China have been allowed to bring in their transceivers and install antennas for listening purposes.

On January 17th, ON4QX reported working a station signing BY1AA at 1406Z on 14010. The operator gave his name as Pyng, was very fluent in English, and said to QSL via Box 68 in Peking. Many Europeans and some W/Ks heard the signal, but apparently ON4QX was the only one to get through. Chances are this was Peking Slim, but Bob is watching the China mail nonetheless.

Where-there-is-a-will-there-is-a-way department . . . N5XX tired of trying to work through the large and unruly mob chasing 3Y1VC on Bouvet and decided there must be a better way. He obtained the telephone number of LA5NM in Norway, telephoned long distance, and persuaded LA5NM to ask 3Y1VC to listen for him after their daily 10 meter CW sked. It worked, and Clark was able to add a rare new one to his DXCC total. Clark says the long-distance charges were only $3.75 for 3 minutes, but he didn't say how many 3 minuteses the persuasion took.

The forthcoming trip in the Pacific by Peter Sutter calls for his vessel, *Wild Spirit*, to be at VR3/Christmas around June 15th, VR3/Fanning around June 20th, and KH5/Palmyra around June 24th. Exact times depend largely upon the trade winds and currents.

The reciprocal licensing agreement between Haiti and the U.S. has apparently hit a snag, with no further action being taken. While on the subject of Haiti, we might mention that the HH authorities report no such license exists for HH2SL who has been showing recently.

Slim joined the YASME DXpedition of Lloyd and Iris Colvin while in the British Virgins and helped fill the log of VP2VDJ. So far, he hasn't forwarded copies of his logs.

The ARRL is running some two months behind in processing DXCC applications. Enclose an SASE and you will at least know your cards arrived safely.

Congratulations to the new officers of the Arkansas DX Association: AF5M/President, W5LQN/VP, K5OVC/Secretary-Treasurer, and K5YY/Executive Committee.

W3KVQ, the long-time QSL manager for 9N1MM, has changed calls and QTHs. He is now Edward Blaszczyk N7EB, 12802 Sun Valley Drive, Sun City AZ 85351.

Although 160 meter operation is not officially allowed in Guatemala, you will occasionally hear a station on. Apparently, as long as the operator is careful about avoiding interference, the signal will not be noted. Guatemala also maintains a ban on phone patches.

A group of USSR types was supposed to head out to Franz Joseph Land last April. If you need FJL and you hear UK1PAA, UK1PAT, or possibly R1FJ, you will know they arrived.

The station at YI1BGD now has both the FT-101E and

*Jun JA2BJW and his nice station. Jun prefers CW because he is fascinated by the prospect of communicating his mind to others through intermittent tones rather than ordinary language. (Photo courtesy of N9YL.)*

FTDX-500 on line and has asked permission to operate other bands and to establish more stations. Meanwhile, it continues to be heard regularly on twenty.

The Southeastern DX Club shipped a remote vfo to A51PN, which has been making the operation a bit easier for Pradhan.

The first USSR amateur radio meeting took place last December in Moscow, with over 200 of the locals showing up. They are hoping for 160 permission with a 10-Watt input. A special "EU" prefix will be used during the summer Olympics to be held in Moscow next year.

Later word has it that K1RH also worked that BY1AA station we mentioned a few items back. Ralph notes that Pyng gave his QTH as Pecinng and that a check with some language experts at Yale indicated this to be an acceptable way of spelling Peking. Ralph caught the station on 28023 at 1455Z. K1RH, like ON4QX, awaits the China mail.

N5KC recently received a direct QSL from VR6TC for a QSO in August, 1973. Never give up.

K5MK resigned as QSL manager for 8P6JD, citing an inability to get the station logs as the reason.

CO2FA is looking for 160 action. He has a 75-meter antenna and can usually be found around 3800. Sometimes CW, sometimes SSB.

Fernando says that if you sent a QSL for a CO2FA contact and do not receive one in return within six months, you should try again. The mail sometimes takes three or four months getting to Havana and there appears to be little way to speed things up. Fernando also mentions that IRCs have little value in Cuba and that a green stamp works much better.

There apparently will be a flood of individuals and groups heading to the Isle of Man during June and July to operate during the celebration of the 1000th anniversary of the Isle of Man parliament, "Tynwald." Look for the GT prefixes.

Bill Rindone, who hasn't been heard from since he was the first to bring DXCC attention to the southern Sudan, ST0, reports that he will be heading back out again this summer. He will be aiming for the East Africa and Indian Ocean area, and more information should be forthcoming soon. You might remember Bill as the last person to activate Geyser Reef before it was deleted from the DXCC countries list.

If you like six meter DX—and there is quite a bit of F-layer stuff around these days—monitor 28885, where news is passed and schedules are made.

RF6F, heard in the CQ DX Contest last fall, was the Radio Club of Voroshilovgrad there in Georgia. Their effort netted 7.8 million points on SSB and 5.9 on CW. The club callsign is UK5MAF, and they are reported to be readying another multi-multi operation for the WPX contest, possibly signing R5M.

VU2KB, often found on 14 MHz CW, is an avid stamp collector and is interested in swapping with like-minded W/K DXers.

John Kanode N4MM has resigned his duties with the W4 QSL Bureau after four years of volunteer labor. John handled the W4/K4/N4 section of the bureau. His duties have been taken over by John Boyd W4WG, with the address remaining the same.

3B8DA is considering another 3B6 effort this summer. Nothing definite at this time, but we will let you know as plans progress.

Last month, we reported on the planned activity by Bruce Frahm K0BJ from the *Yankee Trader* on its ninth world cruise. We have obtained a copy of the ship's scheduled stops and will be reporting these each month. Stops in May include Samoa and Fiji.

The Gilbert Islands will become independent this July. Look for a new prefix to replace the present VR1. Meanwhile, VR1BD can usually be found around 28503 kHz from 2000Z.

9M8HG passes along his sincere thanks to the many DXers worldwide who sent get-well cards during his recent illness. Some W/K DXers donated a new 300-Watt rig and beam to replace Horace's little 80-Watter and dipole. He frequents 21320 kHz at 2200Z and then drops down to the 14225 kHz net at 2300Z. Horace, now 82, was first licensed in 1924 as OB2SK. He won the world DX Contest in 1932, running 5 Watts.

OE6EEG is reported to have forwarded the necessary HZ1BS/8Z4 documentation to the DXCC desk.

A team led by KH6CHL will activate rare Kalawao county on 10 through 80 meters from May 25th to the 27th.

The E/W DX Net which meets each Thursday on 14248 kHz at 0500Z continues to be a gathering spot for Pacific and African DX types.

George Collins VE3FXT will be on hand September 6th to help Vendaland celebrate its independence from SA. A tower is being erected (equipment was left on an earlier trip).

Lloyd and Iris Colvin report making 6,000 contacts from W6KG/TI5 in Costa Rica, split

*Continued on page 162*

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*VU2VKK, in the center, visits with VU2GO and VU2GX while the latter wait in vain with the rest of the VU4ARC Laccadive DXpedition crew for operating permission that never came.*

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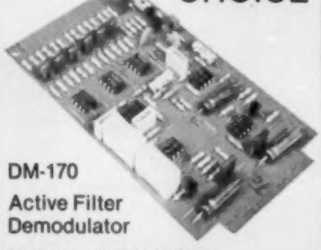

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### OPTO-8000.1A 10Hz to 600MHz Frequency Counter

- Precision TCXO time base 0.1PPM Stability 17-40°C ● Super Sensitivity with preamps in both HI-Z & 50 Ohm inputs <10 mV to 150 MHz <50 mV @ 600 MHz
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| | | |
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| #OPTO-8000.1A | Factory Assembled · **2 Year Guarantee** | $329.95 |
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### CM-1000 Digital Capacitance Meter

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| | | | |
|---|---|---|---|
| #CM-1000 Factory Assembled | $179.95 | #P-1000 Probe | [illegible] |
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| | | | |
|---|---|---|---|
| # T-100 Factory Assembled & Calibrated | $59.95 | # T-100K Kit Form | [illegible] |

| | |
|---|---|
| **#D-450, Antenna,** Rubber Duck, RF Pickup, 450 MHz | [illegible] |
| **#D-146 Antenna,** Rubber Duck, 146 MHz | [illegible] |
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### PROBES:

| | |
|---|---|
| #P-100 50 Ohm, 1X Direct Connection RF Probe | [illegible] |
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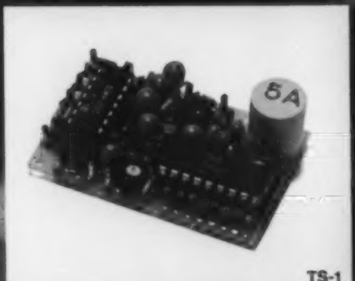
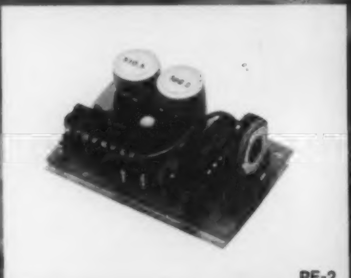


TS-1

TS-1JR


PE-2

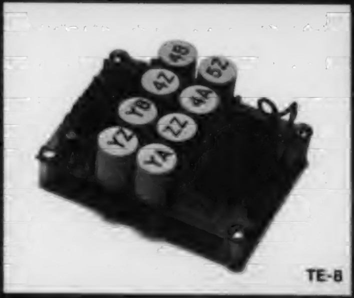
SD-1

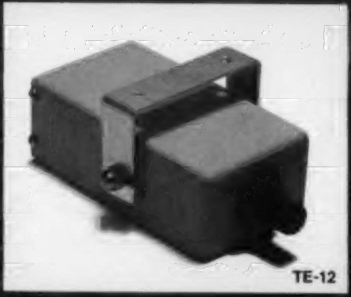
# THE DAWNING

The age of tone control has come to Amateur Radio. What better way to utilize our ever diminishing resource of frequency spectrum? Sub-audible tone control allows several repeaters to share the same channel with minimal geographic separation. It allows protection from intermod and interference for repeaters, remote base stations, and autopatches. It even allows silent monitoring of our crowded simplex channels.

We make the most reliable and complete line of tone products available. All are totally immune to RF, use plug-in, field replaceable, frequency determining elements for low cost and the most accurate and stable frequency control possible. Our impeccable 1 day delivery is unmatched in the industry and you are protected by a full 1 year warranty when our products are returned to the factory for repair. Isn't it time for you to get into the New Age of tone control?

ME-3


TE-8


TE-12

ST-1

# OF A NEW AGE.

**TS-1** Sub-Audible Encoder-Decoder • Microminiature in size. 1.25" x 2.0" x .65" • Encodes and decodes simultaneously • **$59.95** complete with K-1 element.

**TS-1JR** Sub-Audible Encoder-Decoder • Microminiature version of the TS-1 measuring just 1.0" x 1.25" x .65", for hand-held units • **$79.95** complete with K-1 element.

**ME-3** Sub-Audible Encoder • Microminiature in size, measures .45" x 1.1" x .6" • Instant start-up • **$29.95** complete with K-1 element.

**TE-8** Eight-Tone Sub-Audible Encoder • Measures 2.6" x 2.0" x .7" • Frequency selection made by either a pull to ground or to supply • **$69.95** with 8 K-1 elements.

**PE-2** Two-Tone Sequential Encoder for paging • Two call unit • Measures 1.25" x 2.0" x .65" • **$49.95** with 2 K-2 elements.

**SD-1** Two-Tone Sequential Decoder • Frequency range is 268.5 - 2109.4 Hz • Measures 1.2" x 1.67" x .65" • Momentary output for horn relay, latched output for call light and receiver muting built-in • **$59.95** with 2 K-2 elements.

**TE-12** Twelve-Tone Sub-Audible or Burst-Tone Encoder • Frequency range is 67.0 - 263.0 Hz sub-audible or 1650 - 4200 Hz burst-tone • Measures 4.25" x 2.5" x 1.5" • **$79.95** with 12 K-1 elements.

**ST-1** Burst-Tone Encoder • Measures .95" x .5" x .5" plus K-1 measurements • Frequency range is 1650 - 4200 Hz • **$29.95** with K-1 element.

**COMMUNICATIONS SPECIALISTS**
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# LETTERS

## TARA SINGH XZ2KN

I am sending a picture of my late father, Tara Singh XZ2KN. This is the latest picture I have of him, taken just last year. This was taken in Pegu, about 60 miles out of Rangoon. The statue of the Reclining Buddha is the background.

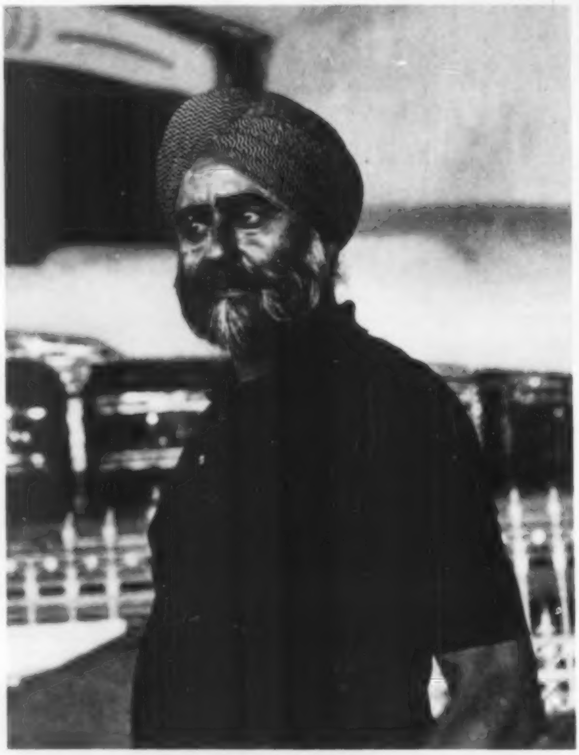
My father was born in Kalaw, Shan States, Burma, in 1918 and was educated in Rangoon. He graduated with a BS in Mechanical Engineering from Rangoon University. He was a very active sportsman and became golf champion twice: He also represented Burma abroad many, many times. He got his amateur license in 1938 and was very active. Soon after, due to WWII, he evacuated to India with his family. They walked to India, a trek which took over 3 months. He had tied his radio equipment to the rafters in the attic to prevent damage in his absence. He was a contractor and was instrumental in building the Burma-China railway before evacuating. On his return, he helped my grandfather with the machine-shop and foundry business. Known as the Empire Foundry, it was one of the largest in Burma. He was an avid believer of the good antenna over high power theory and, having the resources, always was building new antennas. At one time, he built a 4-element wide-spaced beam for 20 meters with a 44-foot boom. The boom used 1" x 1" x ¼" angle iron, and the beam assembly weighed about 2000 pounds. He then got infatuated with cubical quads. The last antenna he built was a 4-element quad, with which he had excellent results. He used an AR-88 receiver and, when he could get it working, an ET-4336 transmittter.

The last rig we used was a Johnson Viking Ranger running 65 Watts—yes, 65 Watts into a 4-element quad. We made many, many stateside contacts and never had trouble or felt inadequate. As no new licenses were being issued, I was the second operator for XZ2KN. Amateur radio was banned on 10 January 1964, and no one has legally operated after that date. The licenses are renewed every year, but with specific instruction not to use the equipment which has not been confiscated. I might mention that my father was the Secretary/Treasurer of the Burma Amateur Radio Society for as long as I can remember. My father was hit by a car while crossing a street on 11 February 1979 in Rangoon. He died in the hospital on the 12th and was cremated on the 13th.

**Gurbux Singh WB9TTN**
**Rochester IL**

P.S. In his last letter, received a week before his death, he wrote that amateur radio was certainly out and that he saw no hope for it in the future.

*Tara Singh was most accommodating when I visited Rangoon, taking the time to show me all around the city so that I could take pictures, introducing me to the British Ambassador (there was no U.S. embassy in Burma), and filling me in on the history of this most interesting country. It was during this short visit that I met Gurbux, his son. While visiting Singapore a few days later, I sent Gurbux some strings for his badminton racquet via a local ham, also named Singh. Eventually, Gurbux had to leave Burma, and the only address he had was 9V1NR in Singapore, who had forwarded the strings for me. The next I heard, Gurbux was marrying 9V1NR's daughter and moving to the U.S. Quite a world! I was saddened to hear that Tara had passed away without ever getting back on the air again, for I remember how his eyes lit up when he talked about amateur radio . . . a true love of his.—Wayne.*



*Tara Singh XZ2KN.*

## IMPRESSED

I'm sorry I haven't written earlier to praise you and your staff for publishing the finest amateur magazine in America. You may not remember me, but my wife and I visited you at your station on Mt. Monadnock before we were married . . . I think it was in 1965 or so . . . back when W2NSD/1 was so strong down here in New Jersey on two meter AM that you could take out most of the locals on my old Gooney box.

I've always been impressed by your sincere devotion to amateur radio, and I read your editorials with interest each month. I ditto your comments about Sam Harris in January *73*. Sam was one of my first two meter "DX" contacts, back when 250 miles was a long haul on that band, and Helen was my first Puerto Rican contact on six meters. He will be missed.

Please keep up the good work, and pray with me that post-WARC '79 days will give you a reason to continue publishing an amateur radio magazine!

**Steve Katz WB2WIK**
**Budd Lake NJ**

## LOYALISTS

From reading your editorials, which I tend to agree with as well as enjoy immensely, it seems to me that there is more than enough evidence to firmly establish the fact that the ARRL is detrimental to the future of amateur radio. When something doesn't function properly, it should either be repaired or discarded; this is the case with the ARRL. Since it is operated in such a manner as to make repair nearly impossible, then, in my opinion, it should be done away with.

I do not agree with the "but it's all we've got" philosophy. As long as the ARRL exists, it is "all we'll have"—they'll see to that! You always make the point that you've been a member of the ARRL for most of your ham career; I fail to see the logic in spending $12 a year to support something I can't believe in. Were you to quit the ARRL, in protest, chances are that 50,000 hams would do likewise and the ARRL would fall in to that degree—or do you have 50,000 loyal followers? Might be interesting to find out.

More than half the hams I have queried about their reasons for joining the ARRL tell me that they "take the magazine," "just joined to get *QST*," etc. That is why I would never subscribe to *QST*—I don't want to be "represented" by the ARRL, at WARC '79 or anywhere else. If we did have a truly representative amateur radio organization, I would endeavor to join and support it. As I've said before, why don't you and some of the prestigious hams who are *73* loyalists resurrect the Institute of Amateur Radio? It's high time!

**Bill Harris K9FOV**
**Lafayette IN**

*Bill, as far as I know, I have no loyal followers . . . and I don't want any. If anyone agrees with what I write, I want it to be on the basis of intelligence, not reaction and emotion. If I were to drop out of the ARRL, I doubt*

*Continued on page 156*

# Yesterday you could admire all-band digital tuning in a short wave receiver.* Today you can afford it.

RF—4900

Tune in the Panasonic Command Series™ top-of-the-line RF-4900. Everything you want in short wave at a surprisingly affordable price. Like fluorescent all-band readout with a five-digit frequency display. It's so accurate (within 1 kHz, to be exact), you can tune in a station even before it's broadcasting. And with the RF-4900's eight short wave bands, you can choose any broadcast between 1.6 and 31 MHz. That's all short wave bands. That's Panasonic.

RF-2900

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And if all that short wave isn't enough. There's more. Like SSB (single sideband) amateur radio. All 40 CB channels. Ship to shore. Even Morse communications. AC/DC operation. And with Panasonic's 4" full-range speaker, the big sound of AM and FM will really sound big. There's also the Panasonic RF-2900. It has most of the features of the RF-4900, but it costs a lot less.

The Command Series from Panasonic. If you had short wave receivers as good. You wouldn't still be reading. You'd be listening.

*Short wave reception will vary with antenna, weather conditions, operator's geographic location and other factors. An outside antenna may be required for maximum short wave reception.

**Panasonic.**
just slightly ahead of our time.

# Contests

*Robert Baker WB2GFE*
*15 Windsor Dr.*
*Atco NJ 08004*

### NEW YORK STATE QSO PARTY

**Starts: 1700 GMT Saturday, May 5**
**Ends: 2359 GMT Sunday, May 6**
**(with a rest period between 0500 and 1200 GMT on May 6)**

Sponsored by the University of Buffalo ARC, WA2NPQ, this contest is open to all amateurs. Stations may be contacted once on phone and once on CW on each band. NY stations may work each other and mobile/portables changing counties may be reworked.

*EXCHANGE:*

QSO number, RS(T), and NY county or state/province.

*FREQUENCIES:*

SSB—3900, 7275, 14285, 21375, 28550.

CW—1810, 60 kHz up from the bottom of each band.

Novice—3725, 7125, 21125, 28125.

*SCORING:*

Score one point per QSO times the number of multipliers: states, provinces, countries, and NY counties for NY stations, or the number of NY counties for others (62 max.). Note that this is the first time NY stations may include NY counties in the multiplier total.

*ENTRIES & AWARDS:*

All entries must contain name, address, and county (if NY). Number the first contact for each new multiplier. A checksheet is required for stations making more than 100 QSOs. Awards to the number 1 score from each county, state, or country. Entrants desiring results please send a #10 SASE. Logs must be received by June 16 to qualify. Send all entries to: Michael Bergman WD2AJS, 45 Swartson Ct., Albany NY 12209.

### FLORIDA QSO PARTY

**Starts: 1500 GMT Saturday, May 5**
**Ends: 2359 GMT Sunday, May 6**

This is the 14th annual Florida QSO Party sponsored by *Florida Skip* and all amateurs worldwide are eligible and invited to participate. Each entrant agrees to be bound by the provisions of this announcement, the regulations of the applicable licensing authority, and the decisions of the *Florida Skip* Contest Committee, which are final. All amateur bands may be used and all stations will separate phone and CW logs! A station may be worked once on each band on each mode. Neither crossband nor crossmode contacts will count for contest credit. Florida stations may work other Florida stations, but for QSO points only. Out-of-state stations may not work each other for contest credit. Contacts made on repeaters do not count! Florida stations will be divided into two classes: Class A stations are those operating portable or mobile on emergency power and running 200 Watts or less inside Florida but outside of their home counties; Class B stations are all other stations operating inside Florida.

*EXCHANGE:*

RS(T) and Florida county or state, province, or country. Out-of-state mobile stations operating not within the jurisdiction of any country send ITU region (1, 2, or 3) in which operating.

*FREQUENCIES:*

CW—355, 7055, 14055, 21055, 28055.

Phone—3945, 7279, 14319, 21379, 28579, 146.52.

*SCORING:*

Florida stations count 1 point per QSO with out-of-state or other Florida stations and multiply by the sum of states (49 max.), provinces (12 max.), DX countries (15 max.), and regions (3 max.) actually worked. Maximum multiplier is 79. Out-of-state stations count 2 points per QSO with each Florida station and multiply by the number of different Florida counties worked (67 max.). Class A Florida stations *only* multiply score by 1.5 to obtain final total.

*AWARDS:*

Certificates for phone and CW top single-operator score in each state, province, DX country, and each Florida county. There are also five plaques to be awarded as follows: high single-operator Florida and out-of-state, CW and phone, and to the Florida club with the highest aggregate score.

*ENTRIES:*

At the direction of the contest committee, stations and/or operators may be disqualified for improper reporting, excessive dupes, errors in multiplier lists, unreadable logs, obvious cheating, etc. Anyone disqualified in this year's Florida QSO Party will be barred from the contest next year. Phone and CW entries are to be separated. Along with legible logs in chronological order, a summary sheet is required with each entry. The summary sheet must contain score, number of QSOs, multiplier, station's callsign, entry class and county of Florida entries, power score for Class A entries, state/province/country/region for out-of-state entries, callsigns of all operators/loggers if multi-op, name of club if part of a club aggregate score, name and address typed or printed in block letters, and a signed declaration that all rules and regulations have been observed. Include a 15¢ stamp for contest results from a future issue of *Florida Skip*. All entries must be received on or before May 31, but late DX entries will be accepted within reason. Mail entries to: *Florida Skip* Contest Committee, PO Box 660501, Miami Springs FL 33166.

### LIARS 10-X QSO PARTY

**Starts: 0001 GMT Saturday, May 5**
**Ends: 2359 GMT Sunday, May 6**

Sponsored by the Long Island Amateur Radio Service (LIARS) Chapter of the 10-X International Net. The object of the contest

## Calendar

| | |
|---|---|
| **May 5-6** | **NY State QSO Party** |
| | **Florida QSO Party** |
| | **LIARS 10-X QSO Party** |
| **May 12** | **World Telecommunications Day Contest—Phone** |
| **May 12-13** | **Luckenbach DXpedition** |
| **May 19** | **World Telecommunications Day Contest—CW** |
| **May 19-20** | **Annual Armed Forces Day Communications Tests** |
| | **ARRL EME Contest (part 2)** |
| | **Michigan QSO Party** |
| | **Massachusetts QSO Party** |
| **May 26-27** | **CQ Worldwide WPX—CW** |
| **June 2-3** | **Minnesota QSO Party** |
| **June 6-7** | **SOWP CW QSO Party** |
| **June 9** | **DAFG Short Contest—SW** |
| **June 9-10** | **ARRL VHF QSO Party** |
| **June 10** | **DAFG Short Contest—VHF** |
| **June 23-24** | **ARRL Field Day** |
| **June 30-July 1** | **Seven-Land QSO Party** |
| **July 4** | **ARRL Straight Key Night** |
| **July 14-15** | **ARRL IARU Radiosport Competition** |
| **July 28-30** | **CW County Hunters Contest** |
| **Aug 4-5** | **ARRL UHF Contest** |
| **Sept 8** | **DAFG Short Contest—VHF** |
| **Sept 8-9** | **ARRL VHF QSO Party** |
| **Sept 9** | **DAFG Short Contest—SW** |
| **Sept 15-16** | **Scandinavian Activity—CW** |
| **Sept 22-23** | **Scandinavian Activity—Phone** |
| **Oct 13-14** | **ARRL CD Party—CW** |
| **Oct 20-21** | **ARRL CD Party—Phone** |
| **Nov 3-4** | **ARRL Sweepstakes—CW** |
| **Nov 17-18** | **ARRL Sweepstakes—Phone** |

## Results

### RESULTS OF THE 14TH ALEXANDER VOLTA RTTY DX CONTEST

| | QSOs | Mult. | Points | Bonus | Score |
|---|---|---|---|---|---|
| 1) I3FUE | 224 | 96 | 3750 | — | 80,640,000 |
| 2) SM6GVA | 199 | 80 | 2263 | 41,000 | 36,067,960 |
| 3) I5MYL | 162 | 76 | 1977 | — | 24,340,824 |
| 4) DJ2YA | 151 | 78 | 1913 | 39,000 | 22,570,314 |
| 5) DL0TS | 152 | 70 | 1868 | 44,000 | 19,919,520 |
| 6) W1MX | 106 | 48 | 3584 | 31,000 | 18,266,392 |
| 7) I2OLW | 135 | 68 | 1931 | — | 17,726,580 |
| 8) G3UUP | 137 | 61 | 1861 | 41,000 | 15,593,377 |
| 9) G3RED | 140 | 52 | 1306 | 47,000 | 9,554,680 |
| 10) VE2QO | 87 | 44 | 2090 | 14,000 | 8,014,520 |
| 11) K4YZV | 67 | 36 | 2208 | 7,000 | 5,332,696 |
| 12) DK0OW | 94 | 41 | 1326 | 34,000 | 5,144,404 |
| 13) OH6AA | 104 | 48 | 793 | 33,000 | 3,991,656 |
| 14) W3KV | 59 | 33 | 2044 | 7,000 | 3,986,668 |
| 15) YO3JJ | 89 | 36 | 951 | 26,000 | 3,073,004 |
| 16) I2ZGP | 72 | 32 | 1287 | — | 2,965,248 |
| 17) EA4XW | 71 | 43 | 926 | 13,000 | 2,840,078 |
| 18) I2WEG | 99 | 42 | 638 | — | 2,652,804 |
| 19) HB9AVK | 64 | 41 | 984 | 12,000 | 2,594,016 |
| 20) I8JRA | 71 | 40 | 813 | — | 2,308,920 |
| SWL | | | | | |
| 1) Horst Ballenberger | 155 | 71 | 1932 | 43,000 | 21,304,660 |

is to contact as many stations as possible on 10 meters, 28.9 to 29.2 MHz.

*EXCHANGE:*

Station call, name, QTH, and 10-X and LIARS membership numbers.

*SCORING:*

Score 1 point per contact; only 2-way QSOs are valid. Add 1 point for each 10-X number and 1 point for each LIARS number with a maximum of 3 points per exchange.

*ENTRIES & AWARDS:*

Only 10-X members are eligible for awards. A first- and second-place certificate to each state, province, or DX foreign country. A first-place trophy to highest scoring participant holding a LIARS number. Any clear method of logging will be acceptable. Include your LIARS number, if any. Send a copy to: Bob Watson, 2 Suffolk Court, Oceanside NY 11572. Please include an SASE if a copy of the results is desired. Logs must be received by June 15.

### LUCKENBACH DXPEDITION
### 0800 May 12 to 1200 May 13, 1979 Central Standard Time
### Callsign: W5TEX

The idea of a "Luckenbach Dxpedition" began as a joke between several stations, including WB5VDL, KB5DV, WB5ROQ, N5AOW, and AI5Q, in early December of 1978. During the course of operating around the bands, they found many amateurs had not only heard of Luckenbach, but also looked forward to working a station there.

Luckenbach, located in the heart of the Texas hill country, was brought to national attention by a country/western hit song by Willie Nelson. It is a town virtually untouched by modern civilization and is nestled between two small rivers. It boasts a general store, one house, and a barn. Their first pay telephone was just installed late last year. It is not uncommon to drive the only street in town and have to stop for the cows to cross.

To make this area available to those desiring a QSO, W5TEX will be operating during the dates/times shown above with a special QSL certificate to commemorate the event. To receive the certificate, stations should send a legal size (4" x 9½") SASE to W5TEX, 2618 Rigsby, San Antonio TX 78222. Only QSOs confirmed by W5TEX logs will receive the certificates. The certificates will be 8½" x 11", printed tricolor on bond paper, and should be a welcome addition to any shack.

Operating frequencies are: CW—7110 and 21110 ±5 kHz; FM—52.525, 29.600, and 146.52; SSB—3900, 7235, 14285, 21360, 28625, 50.110, 144.200, all ±5 kHz.

Kennedy Associates, the South Texas Yaesu dealer, has kindly provided Yaesu radios and station equipment, while antennas will be furnished by Wilson Electronics for this special operating event.

### WORLD TELECOMMUNICATIONS DAY CONTEST
### Phone
### 0000 GMT to 2400 GMT May 12
### CW
### 0000 GMT to 2400 GMT May 19

This contest, sponsored by Liga de Amadores Brasileiros de Radio Emissao (LABRE), was instituted in order to commemorate yearly "World Telecommunications Day" (May 17). Each participating radio amateur will attempt to make the highest possible number of contacts with the different ITU zones of the world in order to enable his country to win the ITU Trophy. Use all bands 80 through 10 meters on phone and CW. Categories include: 1) single operator—multiband; or 2) radio clubs and associations —considered as special multi-operator/multiband participants.

Points are computed separately, certificates being awarded to the top winner in each country on each mode, phone and CW. To the world top winner on each mode, a silver plate.

*EXCHANGE:*

RS(T) and ITU zone.

*SCORING:*

In the same country, any band = 0 points (same country considered as same ITU zone); in another ITU zone/country: in the same ITU zone, but different country = 1 point (any band); in another ITU zone, on the same continent = 3 points (any band); in another ITU zone, on another continent = 5 points (any band). Final score is the sum of QSO points multiplied by the number of ITU zones worked. Repetition of contacts with the same station on different bands will be permitted though each ITU zone must be counted as a multiplier only once.

For this contest, what constitutes a country will be determined by the ARRL DXCC list. In order to obtain the number of points for a country, on each mode of operation, the sum of points earned by the top 5 contestants of the country will be taken. In the case of less than 5 entries from a given country, the sum of points of the submitted logs will be taken. Points earned by participants considered as clubs or multi-operators will not be valid for country points sum.

*Continued on page 154*

## Results

### NINTH WORLD TELECOMMUNICATIONS DAY CONTEST
### ITU TROPHY 1978
### OFFICIAL RESULTS

***ITU TROPHY***

**First Place—Brazil, 1,649,954 points**

***Phone Team***

| | |
|---|---|
| PY3EE | 249,622 |
| ZZ6AM | 181,115 |
| PY4OD | 172,200 |
| ZV2CK | 168,405 |
| PP5AZ | 161,040 |

***CW Team***

| | |
|---|---|
| PY4OD | 229,248 |
| ZX4ITU | 175,456 |
| PS2ITU | 160,360 |
| PY4MA | 82,620 |
| PY2BW | 69,888 |

**Second Place—France, 413,193 points**

***Phone Team***

| | |
|---|---|
| HW6ITU | 135,168 |
| F6EBN | 83,127 |
| HW5ITU | 43,530 |
| F6DLM | 6,256 |
| F6BVB | 2,924 |

***CW Team***

| | |
|---|---|
| F6EBN | 68,556 |
| HW5ITU | 65,496 |
| F8TM | 4,176 |
| F6BHX | 3,960 |
| F6EPO | 1,956 |

***MEDALS***

***Gold—Top Scorer of the World***

**Phone—Lithuania, UP2NK, 275,465**
**CW—Brazil, PY4OD, 229,248**

***Silver—2nd Place in the World***

**Phone—Brazil, PY3EE, 249,622**
**CW—Brazil, ZX4ITU, 175,456**

***Bronze—3rd Place in the World***

**Phone—Brazil, ZZ6AM, 181,115**
**CW—Brazil, PS2ITU, 160,360**

***USA***

***Phone***

**W2LEJ—11,914**
**LU1BAR/W3—3,504**
**N4MM—2,145**
**WB9OBX—396**
**W0IUB—264**
**K5DEC—205**

***CW***

**W9OA—31,995**
**WB0GOB—13,340**
**W0IUB—11,186**
**W7ULC—10,296**
**K8MR—5,096**
**W4YN—4,403**
**W5SOD—3,945**
**W1CNU—3,576**
**N4MM—3,536**
**WB5OON—2,223**
**WB0UCP—950**
**N6GL—848**
**K4JEZ—776**
**W1OPJ—760**
**AA6EE—624**
**WA2PQU—413**

## Results

### RESULTS OF THE FLATLAND FARMER 10-X CHAPTER QSO PARTY, DECEMBER 3, 1978

***World Leader and Grand Champion*—WB7UFO, 144 points**

***Area Leaders***

| *Area* | *Call* | *Points* |
|---|---|---|
| DX | VE6BKO | 106 |
| First U.S. Call Area | WA1SQB | 86 |
| Second U.S. Call Area | WB2MAN | 12 |
| Third U.S. Call Area | No Entries | |
| Fourth U.S. Call Area | WD4OIR | 101 |
| Fifth U.S. Call Area | No Entries | |
| Sixth U.S. Call Area | W6ELR | 85 |
| Seventh U.S. Call Area | WB7UFO | 144 |
| Eighth U.S. Call Area | No Entries | |
| Ninth U.S. Call Area | WB9YJF | 105 |

# RTTY Loop

*Marc I. Leavey, M.D. WA3AJR*
*4006 Winlee Road*
*Randallstown MD 21133*

This month, we complete the second year of RTTY Loop. I must say that it has been, and continues to be, a real thrill to be able to share so many facets of RTTY communication with you all. We have covered a lot of ground in these past two years. Early columns started with the basics of teletype™ circuits, and lately we have worked into digital logic systems. This month, we will dip into the bulging mail sack, in no particular order, to answer, respond to, or pass along some of the thoughts that have been sent in to me.

Starting out on a somewhat oddball vein (but that's routine for this column), I have a letter from Jerry Keefe W0HAQ. Jerry has an SWTPC 6800 computer and a KSR-33. The KSR-33 was apparently used in Britain with a non-standard interface. Jerry, the teletype should directly interface with the serial (MP-S) interface of the SWTPC 6800. You have sent along a circuit, reproduced as Fig. 1, that was given to you as an "RS-232 interface." By my unskilled but logical eye, there is definitely something wrong here! Any readers willing to commit themselves may write their opinion and I will pass it along to Jerry. In the meantime, it might be worth your while to try to get the "standard call control unit" that will turn your ugly duckling into a beautiful swan-etype.

Speaking of computers (how's that for transition), Dave Ewing WB9PHQ sends along word that he is up and running with a bare KIM-1 and homebrew 567 decoder. Sounds interesting, Dave. Send along some details and we will try to spread the word to other KIM and 6502 owners.

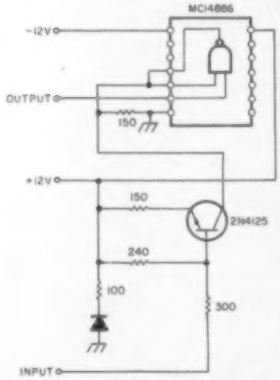

*Fig. 1. W0HAQ's mystery circuit.*

George Young K4SDG is another SWTPC 6800 owner who is trying to get a system up and running on RTTY. George asks about ASCII-to-Baudot conversion in hardware. Well, I would rather do the conversion in software, as the receiving program of last year shows, but, if you are insistent, *73* has published several good hardware conversions in the past few years. One which comes to mind rather quickly was an ASCII-to-Baudot converter described by Cole Ellsworth W6OXP on page 52 of the February, 1976, issue of *73*. This design converts all ASCII characters to the corresponding Baudot character, filling characters which have no match with a Baudot blank. While you're looking at that article in the magazine, you might want to check out the cover story, too. It's out of this world.

One of those things we all like to do is try to copy some of the commercial and press RTTY transmissions for personal enjoyment. Bob Magill WA6MUG is one of several readers interested in such information. I would be willing to compile some sort of list, if any data is available. Readers with information on commercial, press, etc., RTTY transmissions are asked to jot down times, frequencies, shift, speed, ASCII or Baudot, and send them to me at the above address. I'll try to present some useful form in the future.

Some more inquiries have come in on the Microlog RTTY system. To Lee Lust WA2ETQ and the others who have asked my opinion by mail and via other media, all I can do is reiterate what I said a few months back. As of this writing (March, 1979), data promised me in October, 1978, has not arrived. Several hams have used the system, and, while it appears to perform as advertised, it *is* rf-sensitive. If you have any rf around the shack, as with a high swr, you may have trouble. Caveat emptor.

A quick QSL to Clifford Erback VE5QY up there in Moose Jaw, Saskatchewan, Canada. With a Model 15, Flesher 170, and FT-101E, he has quite a nice RTTY station. The F1200B linear and TH6DX beam only help to get him into those "gray areas," right Cliff? Tom (no last name) WB8BDG is another member of the kilowatt club who feeds his TR4 into a MLA2500 linear. Teletype Model 15 and 14 equipment provides the green key interface, along with a HAL ST-5. The last member of this month's teletype group is Howard Olson WA9KEK, whose RTTY equipment consists of a Model 19 feeding either an Icom 245 for two meter RTTY or an NCX3 for HF work. While the abundance of hams on RTTY are using equipment produced by the Teletype Corporation, and most of those are using Model 15/19 setups, there is no clear consensus.

The second most popular machine is usually a product of the Kleinschmidt manufacturing concern. R. B. Gober, DDS W5ZNN writes of the Corsicana Teletype Society. It seems he and another member, N5ALA, are working on a few Kleinschmidt Model TT-100B-FG machines. Also laboring on one of these is Rob Lawson WB4BSZ, who is sweating over a TT-117-FG. Anyone having good wiring and application material is invited to send it along to this column to help get these and other fraters out of a jam.

Along the lines of the press transmissions mentioned earlier, Rob raises the possibility of copying weather data from stations located down south where he lives. Any data on these stations would also be handy.

Some of you may question why I take the space to run down this or that ham's gear, Teletype, computer, etc. When I was new to RTTY, or ham radio in general, I was frequently confused by the vast (at *that* time) proliferation of equipment and systems. Now, here we are in an age of sophistication. Model 99s, 6880 computers, and LSMFT rush into the novice's vantage and mingle into an amorphous blob. What I hope to do is show, by example, what hams are using now on the air. Hopefully, the old and the new will integrate into a unified scheme and the newcomer will be a little better informed when someone offers him a "slightly used Model 12." So much for philosophy.

Next month, we will begin the third year of RTTY Loop as we began the second—exploring the computer in RTTY. I will present a transmitting program for the SWTPC 6800, using a parallel port for output. As with the receiving program of last year, flowcharts will be included to allow adaptation of this program to other systems. Until then, keep on loopin'!

# Ham Help

We are presently setting up a School of Communication here at Toccoa Falls College, Toccoa Falls GA. Being a ham, I have presented the possibilities of amateur radio as a way of communication. We have been given a room and space for antennas. Some of the students have already started working on code and theory. We are now looking for good used equipment for the club station. Any donations of such equipment will be appreciated. Tax-deductible receipts will be given for the good equipment.

We also have a Nagra III Swiss-made tape recorder for which we need a manual. If anyone has one, we would like to copy it. We would buy one if an address can be given as to where to write.

Any help given will be appreciated.

**Dale McMindes KA4HBW**
**Toccoa Falls College**
**Toccoa Falls CA 30577**

I need plans for a 2m duplexer that we can build for our club repeater. We would be interested in buying a used duplexer if someone has one.

**Gene Kirby W8BJN**
**Union Co. Amateur Radio Club**
**13613 U.S. 36**
**Marysville OH 43040**

I need the schematic and/or owner's manual and alignment information for the Courier 50 FM. Any help will be much appreciated.

**Walt Persans WA2ZBE**
**135 Roe St.**
**Staten Island NY 10310**

I am interested in getting in touch with anyone who would like to be involved with an organic gardening net.

**Carl Gorodetzky WD4DKP**
**3526 Richland Ave.**
**Nashville TN 37205**

I have an Eico 720 transmitter that I would like to buy an Eico 722 vfo for. Anyone having such a unit for sale can get in touch with me and we'll work out the details. Thank you.

**Frank D. Paprzycki KA8CKY**
**1529 Henry Ave. S.W.**
**Canton OH 44706**

I am in need of a Shure M-5D monaural phono cartridge for an experimental circuit. I called the warehouse in Evanston, Illinois, and Shure does not have this in stock anymore. Are there any special shops that might stock hard-to-get parts like this? Fellow amateurs seem to be the only source of help. I will gladly pay up to $20.00 for one from someone's junk box.

**Geoffrey W. Tilga WA2YIX**
**196 South Main St. #3**
**Brockport NY 14420**

# NOW YOU CAN HAVE BOTH

## HIGH QUALITY & LOW COST!

DS2000
KSR
HAL DS-2000 KSR
POWER

## The DS2000 KSR FROM HAL

HAL design experience now makes it possible to offer you an efficient, reliable, and cost effective terminal for your RTTY or CW station. Investigate the new DS2000 KSR from the people who KNOW HOW to build RTTY and CW equipment. See how you can get great performance and save money too!

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- *Morse code receive (optional) self tracking speeds from 1-175 wpm on a separate plug-in circuit board (Available June, 1979)*
- *All in a convenient, small cabinet (14.1" x 9.25" x 4.35")*

**Price: $449.00**
Optional Morse Receive Board: $149.00
Optional 9" monitor: $150.00

## BIG PERFORMANCE

### SMALL SIZE. . .SMALL PRICE

If you're looking for an RTTY demodulator with great performance on both the HF and VHF bands, take a look at the ST-5000 from HAL. The use of active filters with no phase-lock loop or 'single-tone' short-cuts ensure the kind of performance you expect. Full features in an attractive and conveniently small package make this demodulator a value that's hard to beat!

- *Hard limiting front end*
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- *Provision for external tuning scope*
- *Attractive, small cabinet (2.75" H x 8" D x 12" W)*
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**Price: $225.00**

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# New Products

## SINCLAIR PDM 35 DIGITAL MULTIMETER

Although around for a few months, the Sinclair PDM 35 digital multimeter is a very versatile unit, considering its compactness, and the price is right! In fact, it may be the lowest-priced commercial pocket digital multimeter on the market.

The PDM 35 provides a very bright reddish-purple 3½-digit display reading to ±1.999. Polarity of the display is automatic and resolution is within 1 mV and 0.1 nA (0.0001 uA). The decimal point is fixed, so it is necessary to mentally extrapolate readings depending upon the range selected. For instance, when the display shows 0.987 and the multiplier switch is on x100, the digits are read as 98.7.

Dc input impedance is 10 megohms for four ranges of dc voltage to a maximum of 1000 volts. Accuracy in this mode is 1.0% ±1 count. A single ac voltage position (40 Hz to 5 kHz) permits readings up to 500 volts rms, accurate to 1.5% ±2 counts, with an input impedance of 450k Ohms. Six current positions switch from 1 nA to 200 mA. Five resistance ranges permit accurate readings from one Ohm to 10 megohms, also with 1.5% accuracy. Five additional junction-test ranges are also available.

The instrument measures resistance by forcing a known constant current through the resistor and measuring the voltage developed. It is possible, using the resistance ranges on the meter, to measure the forward voltage drop of semiconductor junctions and to match the $V_{be}$ of transistors. The current used corresponds to the current range scale, and the display reads the forward voltage drop in volts.

Measuring only six inches by three inches by 1½ inches thick and operating on a single nine-volt battery, the PDM 35 is ideal for use away from the bench. However, on the negative side, I found that the test leads and, more especially, the test lead sockets detract from an otherwise outstanding unit. The leads are stiff and kinky, and inserting and removing the plugs in the sockets is extremely difficult due to the mechanics of both the plug and socket. This is distracting because mode switching is not employed for DCV to ACV to mA/Ohms, and one test lead must be re-inserted for each mode.

With the exception of the x1000 volts dc range and the ac position, all ranges can be used to a maximum displayed value of ±1999. Exceeding this will display =000, or =000, indicating that the next higher range should be selected.

The operating instructions accompanying the multimeter are complete and adequate. A schematic in this booklet is barely legible because of size, even with the use of a 10X magnifier. No parts values or type numbers are shown on the schematic—only component reference designators. Because neither a parts list nor a theory section is provided, these designators serve no purpose.

The PDM 35 comes complete with test leads, soft carrying case, and instruction book. An ac adapter, 30-kV probe, and padded case are extra-cost items. Guarantee period is one year.

*Starshine Group, 924 Anacapa Street, Santa Barbara CA 93101; (800)-528-6050, ext. 1052.* Reader service number S89.

**A. A. Wicks W6SWZ**
**Agoura CA**

## TRAC DELUXE CMOS ELECTRONIC KEYER

Trac Electronics, Inc., has introduced an addition to its line of state-of-the-art CMOS keyers. The Trac Deluxe CMOS Electronic Keyer, Model TE 144, contains all CMOS integrated circuitry. The front panel contains controls for speed, weight, tone, and volume. In addition, a rear-panel switch allows "bug"-type operation (automatic dots, manual dashes) as well as straight-keying operation. The Deluxe CMOS Electronic Keyer provides both dot and dash memory, iambic keying, 5-50 wpm, sidetone, and speaker, all housed in an eggshell-white base and woodgrained top. It is compact in size, 6" x 4" x 2". The unit is operated on a single 9-volt battery and keys both positive- and negative-keyed rigs. Available direct from *Trac Electronics, Inc., 1106 Rand Building, Buffalo NY 14203*, or at most dealers throughout the US and Canada. Reader service number T18.

## DAIWA RF-440 RF SPEECH PROCESSOR

It was the acid test for my brand new Daiwa RF-440 rf speech processor: nighttime phone operation on 75 meters. Would the RF-440 really help my low-power signal punch through the bedlam? My CQ was answered by a station in Pennsylvania. After the usual exchange of pleasantries, I asked him to evaluate the performance of the RF-440 while I switched it in and out. The result of this mini-test? "Without the processor, you were down in the mud; I couldn't copy anything. With the processor, I copy 90%." That was enough for me. I was hooked.

Since that first night, I have used the RF-440 in a variety of situations. While the results are not always as dramatic as the instance cited above, the processor has yet to disappoint me.

The RF-440 is designed to increase "talk power" without introducing distortion and splatter. It's packaged in a very attractive all-metal enclosure that is several cuts above the cheap-looking boxes used by some accessory manufacturers. The small size (6" x 2½" x 6") of the unit and the smooth feel of the controls give the RF-440 the aura of a precision watch. It's solid.

The RF-440 simply installs between your microphone and transceiver. It comes pre-wired for Kenwood equipment, so I had to swap connectors to use it with my Heathkit gear. The processor has an internal ac power supply, but it also operates from 12 V dc for mobile use.

Using the RF-440 is a pleasure. Simply set the gain control for a proper level using the built-in meter, then adjust the output control so as not to overdrive your rig. I adjusted the output control using an oscilloscope, then went on the air and was told that my signal sounded fine, with no distortion. Alternatively, you could start with the control set at its midpoint, then solicit on-the-air opinions for a final adjustment.

One school of thought says that speech processor controls should be inside the case so you can set them and forget them. As a confirmed knob-twiddler, I was pleased to see the controls of the RF-440 right there on the front panel where they belong. This really simplifies matters if you intend to use the processor with more than one microphone or rig. Another convenience is an "OFF" position on the gain control which bypasses the processor for straight-through operation.

The impressive Daiwa product line is being distributed in the USA by the *J.W. Miller Division of Bell Industries, PO Box 5825, Compton CA 90224.* Reader service number B47.

**Jeff DeTray WB8BTH/1**
**Assistant Publisher**

TRAC
DELUXE CMOS ELECTRONIC KEYER
SPEED
WEIGHT
TONE
VOLUME

*Trac's Deluxe CMOS Electronic Keyer.*

RF SPEECH PROCESSOR
POWER
ON
OFF
GAIN
OUTPUT
LEVEL
MIN
OFF
MAX
MIN
MAX
LEVEL
MIC
Professional
RF-440

*Daiwa's RF-440 speech processor.*

Yaesu's new FT-101ZD.

Sabtronics' model 2010A.

### YAESU INTRODUCES THE FT-101ZD

Yaesu Electronics Corporation of Paramount, California, is pleased to announce the introduction of the FT-101ZD transceiver.

The FT-101ZD is all new in design and offers many of the features of the internationally acclaimed FT-901DM.

The FT-101ZD is a no-compromise HF SSB/CW transceiver which offers variable i-f bandwidth for 2.4 kHz to 300 Hz, digital plus analog display, built-in rf speech processor, a built-in ac power supply, a new highly effective noise blanker, rugged 6146B final tubes, all band coverage 160-10 meters, WWV, plus WARC band expandability and a true frequency counter (no more recalibrating when changing modes).

Additionally, the FT-101ZD is compatible with all of the FT-901DM accessories.

The FT-101ZD is now available from your local Yaesu dealer. *Yaesu Electronics Corporation, 15954 Downey Ave., PO Box 498, Paramount CA 90723; phone (213)-633-4007.* Reader service number Y1.

### HIGH-SPEED DIGITAL OPTOCOUPLERS FOR 5-VOLT LOGIC INTRODUCED BY MOTOROLA

Motorola has introduced two fast, low-cost, digital optocouplers for 5-volt logic applications. Designated the MOC5005/6, they offer 7500-volt peak ac isolation and are UL-recognized.

The new high-speed optocouplers' turn-on time is 225 ns (typical) for the MOC5006 and 420 ns (typical) for the MOC5005. The two devices are TTL compatible and are designed for applications requiring very high electrical isolation, fast response time, and digital logic compatibility. Such applications include interfacing computer terminals to peripheral equipment, interfacing with microprocessors, digital control of power supplies, motors, and other servomachine uses.

Designed as a digital converter, the application of current to the LED input results in a low voltage output; with the LED off, the output voltage is high. The circuits are current-, voltage-, and temperature-compensated and will sink an eight-gate fanout (13mA) from DTL, TTL, or CMOS with an applied power supply voltage of 5 volts and 16 mA applied to the input. The units offer built-in hysteresis and internal pull-up resistor and feature low power consumption of 4 mA (typical) @ 5 volts in the ON state.

Delivery is from factory stock and authorized Motorola distributors. *Motorola Semiconductor Products Inc., PO Box 20912, Phoenix AZ 85036; phone (602)-244-6900.* Reader service number M20.

### NEW LOW-COST 3½-DIGIT DMM OFFERS TOUCH-HOLD FACILITY

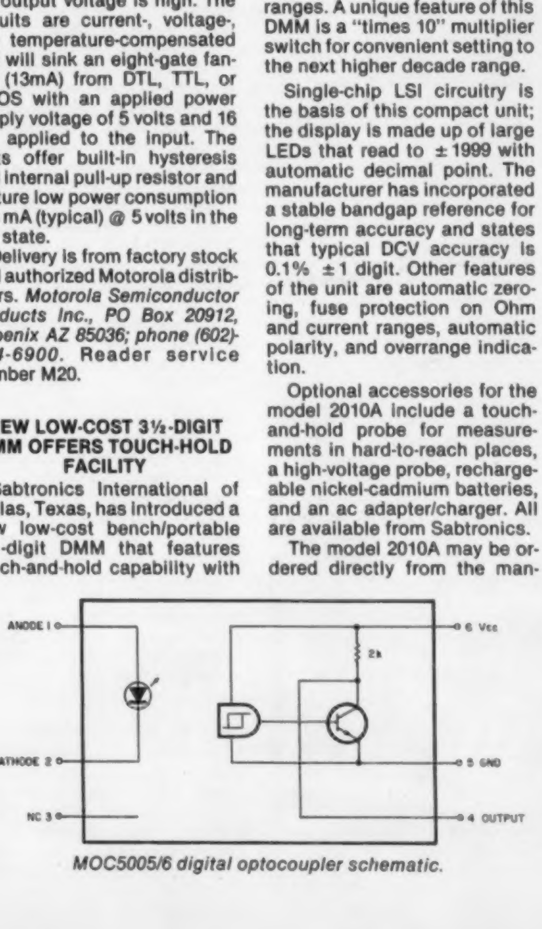
Sabtronics International of Dallas, Texas, has introduced a new low-cost bench/portable 3½-digit DMM that features touch-and-hold capability with an optional test probe. This permits retaining the display's reading even when the probe is removed from the circuit. The model 2010A DMM provides standard ac, dc, and high/low-power resistance measurements in 31 ranges.

The model 2010A DMM is designed for current measurements up to 10 Amps (ac or dc), with an ac frequency response from 40 Hz to 50 kHz, and with an input overload protection to 1200 V dc or rms on voltage ranges. A unique feature of this DMM is a "times 10" multiplier switch for convenient setting to the next higher decade range.

Single-chip LSI circuitry is the basis of this compact unit; the display is made up of large LEDs that read to ± 1999 with automatic decimal point. The manufacturer has incorporated a stable bandgap reference for long-term accuracy and states that typical DCV accuracy is 0.1% ± 1 digit. Other features of the unit are automatic zeroing, fuse protection on Ohm and current ranges, automatic polarity, and overrange indication.

Optional accessories for the model 2010A include a touch-and-hold probe for measurements in hard-to-reach places, a high-voltage probe, rechargeable nickel-cadmium batteries, and an ac adapter/charger. All are available from Sabtronics.

The model 2010A may be ordered directly from the manufacturer. Write *Sabtronics International, 13426 Floyd Circle, Dallas TX 75243; phone (214)-783-0994.* Reader service number S27.



MOC5005/6 digital optocoupler schematic.

### 10 NSEC LOGIC PROBE IS LOW COST

The new PRB-1 digital logic probe costs less yet offers the full features of much more expensive probes. It detects pulses as short as 10 nsec and has a frequency response to 50 MHz or better. The unit provides automatic pulse stretching to 50 nsec (+ and −) and is fully compatible with all RTL, DTL, HTL, TTL, MOS, CMOS, and microprocessor logic families. It also features 120k-Ohm impedance, power lead reversal protection, and overvoltage protection to +70 V dc. Constant brightness LEDs are provided over the full supply voltage range of 4-15 V. There is an optional PA-1 adapter for use with supply voltages of 15-25 V. Included are a six-foot coiled power cord and tip protector. The unit comes neatly packed in

OK's PRB-1 digital logic probe.

500MHz
PRESCALER
PS•500
÷10
DIRECT
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CSC's 500-MHz prescaler.

VOL—SQ
pace COMMUNICATOR II 2M/FM TRANSCEIVER
MIC
SYNTHESIZER
MHz
100kHz
10kHz
5kHz
POWER
HI
LO
ON
OFF

The Communicator II from Pace.

a reusable case with complete troubleshooting instruction booklet. It is available at local electronics distributors and retailers or directly from *O.K. Machine and Tool Corporation, 3455 Conner Street, Bronx NY 10475; phone (212)-994-6600.* Reader service number O5.

### CSC 500-MHz PRESCALER NOW AVAILABLE

Continental Specialties Corporation first previewed their new PS-500 500-MHz frequency prescaler at spring's NEWCOM show, then officially introduced it at summer's WESCON show. Actual production began in late summer, and quantities are now in stock for immediate delivery.

The PS-500 prescaler has been designed to complement CSC's MAX-50 and MAX-100 frequency counters.

For additional information, contact *Continental Specialties Corporation, 70 Fulton Terrace, New Haven CT 06509; (203)-624-3103, TWX (710)-465-1227.* Reader service number C9.

### "BEARCAT® 220" SCANNER RECEIVES AM AIRCRAFT BAND PLUS FM PUBLIC SAFETY BANDS

Electra Company has announced a breakthrough development in scanner technology that allows a single scanning monitor to receive not only public safety, marine, ham, and other FM frequencies, but also the AM aircraft frequencies. The new Bearcat 220 scanner is the first scanning monitor which combines AM and FM reception capability. Until now, two of the most popular monitoring activities—listening to aircraft and listening to police calls—had to be received on separate monitor receivers. But now, six VHF and UHF FM public service bands plus the AM aircraft band are covered by this single radio.

The new Bearcat 220 also features three search operations for finding active local frequencies. It has the normal search operation where frequency limits are set and the scanner searches between them. All active aircraft and marine frequencies are preprogrammed into the scanner's search memory so frequency limits aren't necessary. The user simply pushes the aircraft or the marine search button and the BC 220 seeks out the aircraft or marine frequencies being used locally.

Crystal-less push-button frequency entry which was pioneered in the Bearcat 210 scanner is used in the Bearcat 220. The actual frequencies being monitored are shown on a bright digital display. Up to 20 frequencies can be in any sequence or mix of bands. A priority function is also provided, instantly alerting the listener when a call is made on the priority frequency programmed into the channel one position. Channels can also be activated in banks of 10, permitting the operator to "call up" a group of 10 channels with one push-button.

Other features included in the Bearcat 220 are patented selective scan delay, scan speed selection, ac/dc operation, automatic and manual squelch, individual channel lock-out, and direct access to any programmed channel without the need to manually step through channels. Electra Company's patented "track tuning" is used to provide optimum reception across entire frequency bands. Complete details are available from Bearcat suppliers or by writing to *Electra Company, PO Box 29243, Cumberland IN 46229.* Reader service number E40.

Bearcat 220

New Bearcat 220 scanner.

### PACE'S COMMUNICATOR II

Pace Communications Division of Pathcom, Inc., has been known for its superb CB and commercial FM two-way radio products for many years. A few months ago, the Amateur Radio Products Group of Pace introduced its Communicator line. Top of the line is a 4-MHz, 800-channel, all-synthesized two meter FM mobile, the Communicator II.

By using three knobs (MHz, 100 kHz, and 10 kHz) and an in-out push-button for 5 kHz, the receive frequency is rapidly dialed into the unit and displayed on the .375" 6-digit LED readout. Transmit is selected by a 5-position rotary switch giving simplex, ±600-kHz, and ±1-MHz splits. When the PTT is depressed, the digital readout automatically shifts from receive frequency to transmit frequency, leaving no doubt as to where the unit is set. Also of note is a push-on, push-off power switch that relieves the user of having to reset the volume control. The Communicator II weighs 6.6 pounds and is 6.4" W x 2.8" H x 10.2" L. Current draw is 1-1.5 A receive and 1.5 A (1 W)-6.0 A (25 W) transmit.

Using 52 diodes, 8 LED units, 32 transistors, 6 FETs, and 18 ICs, the Communicator II operates in a 16F3 mode. Power output is 1 or 25 Watts push-button controlled (with the 25 Watts being adjustable for those who wish QRP). Frequency deviation is ±5 kHz maximum. Spurious harmonics are 65 dB below carrier. Frequency stability is ±5 ppm for −30° to +60° C.

The receiver is a double superheterodyne using 16.9-MHz and 455-kHz i-fs. Sensitivity is less than .4 microvolts for 20 dB quieting (.20 microvolts for 12 dB SINAD). Image and receiving spurious rejection is 65 dB down; selectivity is 65 dB down at ±12 kHz. The internal 8-Ohm speaker allows 1.2 Watts at 10% THD. One of the 8-mm plug jacks on the rear mutes the internal speaker when an external speaker is connected. The other 8-mm jack allows not only an external speaker to be used,

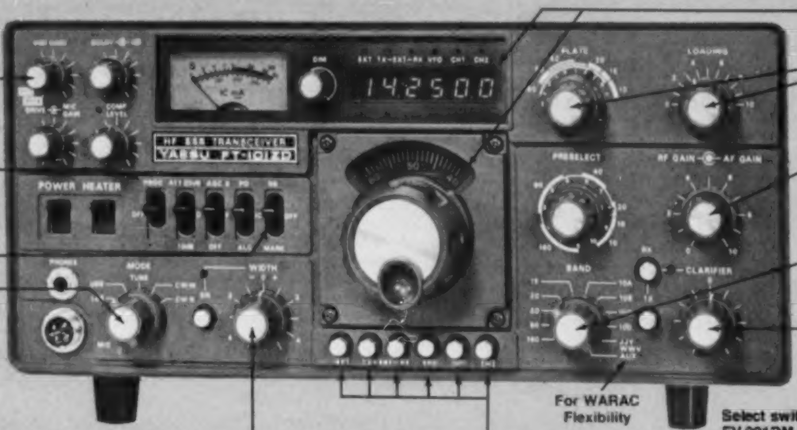
*Continued on page 163*

### ALL NEW

# FT-101ZD

## HIGH-PERFORMANCE HF TRANSCEIVER

**Today's technology, backed by a proud tradition, is yours to enjoy in the all-new FT-101ZD transceiver from YAESU. A host of new features are teamed with the FT-101 heritage to bring you a top-dollar value. See your dealer today for a "hands on" demonstration of the performance-packed FT-101ZD.**



**Diecast front panel, plus heavy duty case**

**Built-in, fully adjustable, VOX circuitry**

**Built-in RF speech processor for more "talk power" when you need it**

**Built-in, threshold adjustable, noise blanker**

**Equipped for SSB and CW operation. Choice of wide or narrow bandwidth for CW (with optional CW filter installed)**

**Continuously variable IF bandwidth: 300 Hz to 2.4 KHz**

**Digital plus analog frequency readout. Digital display resolution to 100 Hz**

**Rugged 6146B final amplifier tubes with RF negative feedback**

**RF and AF gain controls located on concentric shafts for operator convenience**

**Full band coverage: 160 through 10 meters, plus WWV/JJY (receive only)**

**TX, RX, or transceive frequency offset from main dial frequency**

**For WARAC Flexibility**

**Select switches for use with FV-901DM synthesized scanning VFO (option). FV-901DM provides scanners plus 40 frequency memory bank.**

## SPECIFICATIONS

### TRANSMITTER

**PA Input Power:**
180 watts DC

**Carrier Suppression:**
Better than 40 dB

**Unwanted Sideband Suppression:**
Better than 40 dB @ 1000 Hz, 14 MHz

**Spurious Radiation:**
Better than 40 dB below rated output

**Third Order Distortion Products:**
Better than −31 dB

**Transmitter Frequency Response:**
300-2700 Hz (−6 dB)

**Stability:**
Less than 300 Hz in first 30 minutes after 10 min. warmup; less than 100 Hz after 30 minutes over any 30 min. period

**Negative Feedback:** 6 dB @ 14 MHz

**Antenna Output Impedance:**
50-75 ohms, unbalanced

### GENERAL

**Frequency Coverage:**
Amateur bands from 1.8-29.9 MHz, plus WWV/JJY (receive only)

**Operating Modes:**
LSB, USB, CW

**Power Requirements:**
100/110/117/200/220/234 volts AC, 50/60 Hz; 13.5 volts DC (with optional DC-DC converter)

**Power Consumption:**
AC 117V: 75 VA receive (65 VA HEATER OFF) 285 VA transmit; DC 13.5V: 5.5 amps receive (1.1 amps HEATER OFF), 21 amps transmit

**Size:**
345 (W) × 157 (H) × 326 (D) mm

**Weight:**
Approximately 15 kg.

***COMPATIBLE WITH FT-901DM ACCESSORIES***

### RECEIVER

**Sensitivity:**
0.25 uV for S/N 10 dB

**Selectivity:**
2.4 KHz at 6 dB down, 4.0 KHz at 60 dB down (1.66 shape factor); Continuously variable between 300 and 2400 Hz (−6 dB); CW (with optional CW filter installed): 600 Hz at 6 dB down, 1.2 KHz at 60 dB down (2:1 shape factor)

**Image Rejection:**
Better than 60 dB (160-15 meters); Better than 50 dB (10 meters)

**IF Rejection:**
Better than 70 dB (160, 80, 20-10 m); Better than 60 dB (40 m)

**Audio Output Impedance:**
4-16 ohms

**Audio Output Power:**
3 watts @10% THD (into 4 ohms)

arma

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# Microcomputer Interfacing

Peter R. Rony
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**GLOSSARY**

*Subprogram*: A section of a program which may perform a particular operation to be used with a larger program. Subprograms are not general-purpose and are generally used by one program.

*Subroutine*: A program which is general-purpose and which may be called or used by a main program or another subroutine.

*Main Program*: A short notation to indicate the software tasks which will occupy most of the computer's time.

*Link*: A pointer address which will point the computer to another section of a program or back to a program which it may not be currently using.

*Nesting*: The operation of one subroutine within another, e.g., a one-minute delay subroutine may call a one-second delay subroutine 60 times.

## SUBROUTINES AND STACKS

Subroutines are powerful software building blocks. They facilitate program development since they may be written and tested apart from the main body of software. In addition, they can be adapted for use with almost any type of program. In this month's column, we will focus upon their operation as well as on the use of stack instructions.

Both *unconditional* and *conditional jump* instructions transfer computer control to another software task starting at the sixteen-bit address specified within the jump instruction itself. The jump instruction is a one-way branch since it points to a single address, as illustrated in Fig. 1. In many software tasks, however, there exist short subprograms which are used repeatedly. Examples of such tasks include mathematical computation, control, and teletypewriter input/output routines. It seems wasteful to duplicate these subprograms throughout the main program, so an attempt is made to separate them at the end of the main program and, in some manner, branch to them when they are needed.

The use of jump instructions to access these subprograms will not be successful since there will be no *link* back to the main program once the subprogram's task is completed. The use of an additional jump instruction at the end of the subprogram which points back to the main task is unsatisfactory, since jump instructions can point to a single address. This is also illustrated in Fig. 1. The jump instructions at 2 and 3 point to the same subprogram, but upon completion of the subprogram's task, the jump instruction at 4 can only provide a link to one place. A new operation, the *call* instruction, is required. This has the effect of inserting the subprogram's software steps in the main program flow at points 2 and 3, but without the problems associated with the use of a jump.

The call instruction, like the jump instruction, transfers control to another portion of the software. When that portion has completed its task, however, control is returned to the main program. This is illustrated in Fig. 2. In the figure, two subroutines are used by the main program, each being accessed by a call instruction which specifies the starting address of the subroutine as a sixteen-bit, or two-byte, word. *At the completion of the subroutine, control is returned to the next instruction which follows the three-byte call instruction.* Through the use of call instructions, the program shown in Fig. 2 has inserted the subroutine program steps in the flow of the main software task. Subroutine number 2 is used only once, but subroutine number 1 has been used twice although it is present only once in the microcomputer's memory.

Each subroutine is accessed via a call instruction and ends with a *return* instruction RET. The return is a one-byte instruction which does not contain any address information, yet it acts to return control to the main program. The return of control takes place since the call instruction saves a *linking*, or return, *address* which acts to branch the computer back to the address of the instruction immediately following the three-byte call. The return instruction causes the microcomputer to retrieve the address from storage and use it as the link back to the main task.

The sixteen-bit return addresses associated with call instructions are stored in an area of read/write memory called the *stack*. The transfer of address information is performed automatically by the 8080 microprocessor chip to and from the stack during call and return operations. Thus, the 8080 chip *pushes* the return address onto the stack during the execution of a call and *pops* it off the stack during a return. The actual memory area set aside for the stack is determined by the programmer through the use of an LXISP instruction, which loads the sixteen-bit starting address of the stack into the *stack pointer register* located within the 8080 chip. It is the programmer's responsibility to set up a stack pointer before calls and returns are used; the programmer must also make certain that the stack area will not be used for other purposes during program execution.

In the program example shown in Table 1, we decided that the stack should have a starting address of 003 377. The first step in the main program, therefore, is to set the stack pointer to this address using the LXISP instruction. Later, when a call instruction is executed, the 8080 chip transfers the return address to the stack area of R/W memory. If the stack pointer is initially set at address X, the return address is stored with the low address byte in location X-2 and the high address byte in location X-1. Thus, *the stack adds address data at addresses below the address value of the stack pointer.* When the return address is popped back into the 8080 chip, the stack pointer is automatically incremented back to address X as the return is retrieved byte by byte. When the next subroutine is called, the stack locations are used for storage of the new return address, since the old return address has already been popped back into the 8080.

Subroutines may be placed one within another, or *nested*.

Continued on page 150

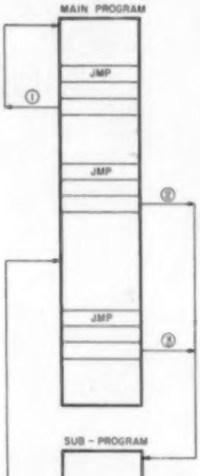

*Fig. 1. Diagram illustrating the characteristics of the jump instruction.*

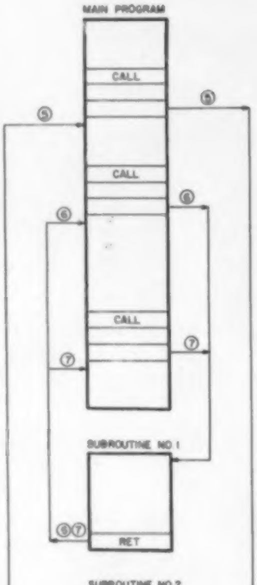

*Fig. 2. Diagram illustrating the characteristics of the call and return instructions.*

```
                          *003 000
003 000 061  START.  LXISP   /SYMBOLIC ADDRESS OF START
003 001 3770         377
003 002 000          000
003 003 333  LOOP.   IN      /INPUT DATA FROM PORT 5
003 004 005          005
003 005 376          CPI     /COMPARE IT TO 026
003 006 026          026
003 007 312          JZ      /IF IT MATCHES GO TO "DETECT"
003 010 015          DETECT
003 011 003          0
003 012 303          JMP     /IF IT DOESN'T MATCH, GO TO
003 013 003          LOOP    /LOOP AND CHECK AGAIN
003 014 003          0
003 015 171  DETECT. MOVAC
003 016 323          OUT
003 017 0070         007
003 020 166          HLT
```

*Table 1. Software example showing a typical assembler output.*

# Imagine All The Places You Can Tuck ICOM's Remotable IC-280. (Think small.)

The **IC-280** 2 meter mobile comes as one radio to be mounted in the normal manner: but, as an option, the diminutive front one third of the radio detaches and mounts by its optional bracket, while the main body tucks neatly away out of sight. Now you can mount your 2 meter radio in pint-sized places that seemed far too cramped before.

Measuring only 2¼"h x 7"w x 3⅜"d, the bantam-sized microprocessor control head fits easily into the dash, console or glove box of even the most compact vehicle. Or if those places are already taken by the rest of your "mobile shack," the **IC-280** head squeezes into leftover nitches under the dash, overhead, under the seat or even on the steering column.

But don't be misled by the petite size of this subdivided radio: the **IC-280** is jam packed with the latest state of the art engineering and convenience features. No scaled down technology here!

With the microprocessor in the detachable control head, your **IC-280** can store three frequencies of your choice plus the dial, which allows you to select from four frequencies with the front panel switch without taking your eyes off the road. These frequencies are retained in the **IC-280's** memory for as long as power is applied to the radio, even when power is turned off at the front panel switch. And if power is completely removed from the radio the ±600 KHz splits are still maintained!

The **IC-280** works frequencies in excess of the 2 meter band with ICOM's outstanding single-knob tuning, so you can listen around the entire band without fooling with three tuning knobs. With steps of 15 KC or 5 KC, the **IC-280** puts rapid and easy frequency change at your single fingertip and instantly displays bright, easy to read LED's.

---

**Available Options:**
- Touch Tone pad/microphone combination, which fits the mic plug on the radio face with absolutely no modification

  (Fits all ICOM 4-pin mic radios.)
- 15' unassembled cable kit for long distance remote mounting of the detachable control head

**IC-280**
2 meter FM, 4+MHz
Mobile Transceiver

If you are a newly licensed novice, send for ICOM's catalog and discount purchase coupon. Mail your name, call sign and date of license to your ICOM distributor (see the bottom of this ad).

---

**All ICOM radios significantly exceed FCC regulations limiting spurious emissions.**

**Specifications subject to change without notice.**

**IC-280 Specifications:** ☐ Frequency Coverage: 143.90—148.11 MHz ☐ Operating Conditions: Temperature: −10°C to 60°C (14°F to 140°F), Duty Factor: continuous ☐ Frequency Stability: ±1.5 KHz ☐ Modulation Type: FM (F3) ☐ Antenna Impedance: 50 ohms unbalanced ☐ Power Requirement: DC 13.8V ±15% (negative ground) ☐ Current Drain: Transmitting: 2.5A Hi (10W), 1.2A Lo (1W), Receiving: 0.630A at max audio output, 0.450 at SQL ON with no signal ☐ Size: 58mm(h) x 156mm(w) x 228mm(d) ☐ Weight: approx. 2.2 Kg ☐ Power Output: 10W Hi, 1W Lo ☐ Modulation System: Phase ☐ Max. Frequency Deviation: ±5 KHz ☐ Spurious Output: more than 60 dB below carrier ☐ Microphone Impedance: 600 ohms dynamic or electret condenser type, such as the SM-2 ☐ Receiving System: Double superheterdyne ☐ Intermediate Frequency: 1st: 10.695 MHz, 2nd: 455 KHz ☐ Sensitivity: 1 uv at S+N/N at 30 dB or better, Noise suppression sensitivity 20 dB, 0.6 uv or less ☐ Selectivity: less than ±7.5 KHz at −6 dB, less than ±15 KHz at −60 dB ☐ Audio Output: More than 1.5W ☐ Audio Output Impedance: 8 ohms

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# CB to 10

## —part XVIII: several PLL rigs

### Who called it "Ancient Mode?"

Recently, many hams have been converting CB radios to operation on the 10 meter ham band. With 40-channel CBs being sold now, there are many good used 23-channel units available at very reasonable prices. Some of these units will make very handy 10 meter AM phone transceivers, as they contain excellent AM receiver sections as well as efficient 4-Watt output transmitter sections in a small package ideal for mobile use. One of these units which may be easily (a few hours of work at most) and cheaply (less than $10 for the conversion and perhaps $40 to $50 for the radio) put on ten meters is the Midland model 13-882 C.

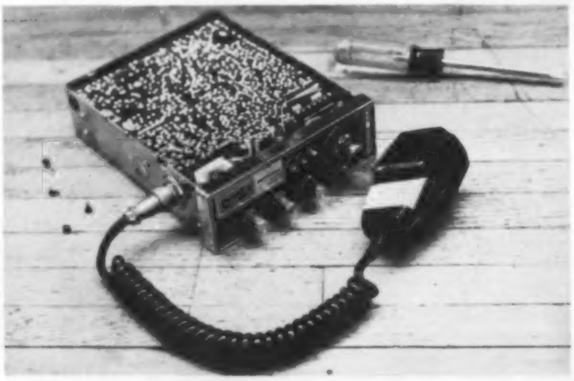

*Photo A. An overall shot of the rig with the case off.*

Although this article is concerned primarily with the 13-882C, the information can be applied to the following radios which use the PLL-02A phase-locked-loop IC in the same circuit configuration:

General Motors—CBD-10;
Hy-Gain—2680, 2681, 2683;
Kraco—KCB-2310B, -2320B, -2330B;
Lafayette—HB-650, -750, -950, Micro-223A
Lafayette—Com-phone 23A, Telsat 1050;
Midland—13-830, -857B, -882C, -888B, -955;
Pearce-Simpson—Tiger 23 MK II, Tiger 40A (40 ch.);
Truetone—CYJ-4732A-77, MCC-4434B-67.

There are probably more units containing the PLL-02A in the arrangement discussed here. They can be recognized by the numbers PLL-02A on the chip near the front of the rig, three crystals in the radio, and the numbers PTBMO33AOX, PTBMO-36AOX, PTBMO37AOX, or PTBMO39AOX on the circuit board. There are some 40-channel radios using the PLL-02A in a different arrangement (only two crystals) which cannot be put on 10 meters by the method described here, as the crystal that has been eliminated is the crystal to be changed in this modification. Also, it should be noted that earlier versions of the units listed above do not use the same circuitry. The Kraco KCB-2330, for example, uses a crystal synthesizer, and the KCB-2330A uses a PLL-01A chip, which is not equivalent to the PLL-02A chip.

#### Operation of the PLL-02A

The voltage-controlled oscillator (vco), whose frequency is controlled by the PLL-02A chip and associated circuitry, provides injection to the first receiver mixer and to a transmitter mixer stage. The oscillator operates at 10.695 MHz above the operating frequency, or 37.660 to 37.950 MHz for operation on CB channels 1 to 23.

Output from the vco is also mixed with the third harmonic of the 11.80666 MHz crystal oscillator (Q105) at 35.420 MHz, to produce a difference frequency of 2.24 to 2.53 MHz, which is fed into pin 2 of the PLL chip. 10.240 MHz energy from the 10.240 MHz reference/second receiver mixer injection oscillator is fed into the IC at pin 3.

Inside the IC, the 10.240 MHz signal is divided by 1024 to produce a 10.00 kHz reference signal. The 2.24 to 2.53 MHz signal is divided by n, where n is a number determined by the binary coding from the channel switch to pins 7-15 of the IC. See Table 1.

For channel 1, n is 224, dividing the difference frequency at pin 2 by 224. This frequency is compared to that of the 10.00 kHz reference signal. If the output of the n divider is less than 10.00 kHz, the voltage at pin 5 of the PLL chip (the control voltage for the vco) is raised, causing the frequency of the vco to increase. If, on the other hand, the frequency of the n divider output is higher than 10.00 kHz, indicating that the vco is too high in frequency, the voltage at pin 5 drops, lowering the vco's frequency. This action, similar to that of a thermostat, regulates the frequency of the vco. By changing the value of n (the job of the channel switch) or the frequency of the 11.80666 MHz oscillator and adjusting the slug in the vco oscillator coil (to set its tuning range), the operating frequency of the vco, and thereby the operating frequency of the entire rig, can be changed, while maintaining stability approaching that of a crystal oscillator.

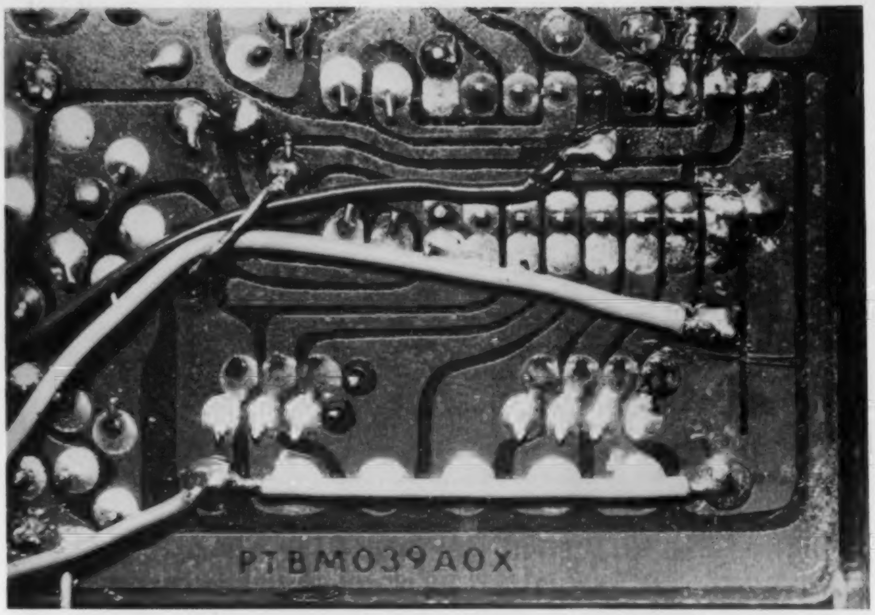

*Photo B. Close-up of the channel-switch area of the circuit board, showing the modification to provide 23 additional channels 320 kHz above the "normal" 23 channels.*

**Conversion to 10 Meters**

To convert the radio to 10 meters, the 11.80666 MHz oscillator must be changed. The frequency required to give channel 1 a frequency of "F" MHz is:

crystal frequency (MHz) = (F + 8.455)/3

or 12.405 MHz for channel 1 at 28.760 MHz, the channel 1 for many converted CBs now in use, especially in the Los Angeles, California, area. The crystal should be available from any of the major crystal manufacturers. When ordering, specify the frequency desired and the model of radio you are converting. The crystal manufacturers usually have information on holder type, load capacity, and other specifications for CB units on file. If not, send a copy of the oscillator schematic along with the order.

To get the rig up to ten meters, the vco must be moved to near 39 MHz and the transmitter must be completely realigned. The easiest way I have found to do this is to use a dummy load, wattmeter, or other output indicator, frequency counter, or receiver covering 27 to 29.5 MHz with some accuracy and a signal generator or steady on-the-air signal in the following procedure.

With the unit off, isolate pins 5 and 6 of the PLL from the circuit board foil (use solder wick to remove the solder). Pin 6 is a protection voltage which drops to 0 if the PLL fails to lock up (i.e., the PLL can't regulate the vco frequency for some reason) and disables the transmitter. Pin 5 is the control voltage to the vco. Temporarily connect a jumper wire from pin 1 (5-volt supply to the IC) to the foil at pins 5 and 6, without connecting to the pins themselves. It probably wouldn't hurt the IC if the pins did touch, but, at $12.00 or more for a replacement IC, I don't recommend taking chances. This temporary modification runs the vco at maximum frequency, unlocked from the PLL, and overrides the transmitter disable line, allowing the transmitter to function. Connect the wattmeter and dummy load to the transmitter. Connect the frequency counter according to its instructions to monitor transmitted frequency.

Turn the unit on and key the transmitter. The frequency counter should read somewhere above 27.4 MHz. Tune the slugs of T111, L103, L104, T102, T103, L106, L109, and L110 for maximum output (the numbers are next to the coils on the circuit board). Exercise extreme caution in tuning, as the slugs are very fragile. Tune the vco oscillator coil, T101, until the frequency is about 300 kHz higher and retune the above coils for maximum

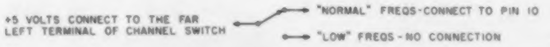
+5 VOLTS CONNECT TO THE FAR LEFT TERMINAL OF CHANNEL SWITCH
"NORMAL" FREQS-CONNECT TO PIN 10
"LOW" FREQS - NO CONNECTION

*Fig. 1.*

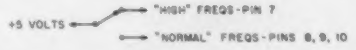

*Fig. 2.*

| n | Ch. | Freq. | pin: 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 224 | 01 | 26.965 MHz | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 225 | 02 | 26.975 MHz | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 226 | 03 | 26.985 MHz | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 228 | 04 | 27.005 MHz | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| 229 | 05 | 27.015 MHz | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 230 | 06 | 27.025 MHz | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 231 | 07 | 27.035 MHz | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 |
| 233 | 08 | 27.055 MHz | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| 234 | 09 | 27.065 MHz | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 235 | 10 | 27.075 MHz | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 236 | 11 | 27.085 MHz | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 238 | 12 | 27.105 MHz | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 239 | 13 | 27.115 MHz | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 240 | 14 | 27.125 MHz | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 241 | 15 | 27.135 MHz | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 243 | 16 | 27.155 MHz | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |
| 244 | 17 | 27.165 MHz | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 245 | 18 | 27.175 MHz | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 246 | 19 | 27.185 MHz | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| 248 | 20 | 27.205 MHz | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| 249 | 21 | 27.215 MHz | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 250 | 22 | 27.225 MHz | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 253 | 23 | 27.255 MHz | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| 255 | 27 | (see text) | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Binary number: | | | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

A 1 indicates 5 volts at pin; 0 indicates no voltage.

*Table 1.*

output. Repeat the procedure, "walking" the transmitter up to about 200 kHz above your highest ten meter channel (about 29.35 MHz for channel 1 at 28.760 MHz). Turn the unit off.

Disconnect the 5-volt jumper wire which was temporarily installed from pins 5 and 6 to pin 1 and reconnect the pins to the foil. Turn the unit back on, and set the channel switch to channel 1. Adjust the trimmer capacitor next to the crystal for the proper output frequency. Turn the channel switch to channel 18. Adjust all of the coils mentioned except T101, the vco coil, for maximum power output. (This is done at a higher-than-center frequency because the power output drops off faster above the peak frequency than below. This is normal even on 11 meters and should not be the cause of any worries about changing capacitor values, trimming coils, etc., unless the coils just refuse to resonate. All three units I have converted have tuned beautifully with 4 to 5 Watts output without juggling any component values.)

Connect the transceiver to the signal generator or other signal source. Set the channel switch to channel 12 and adjust the generator for output on the same frequency. Adjust the rf stages in the receiver (T104 and L112) for maximum received signal strength on the S-meter. Alignment of the other receiver tuning adjustments should not be necessary, as the i-fs are on the same frequency as when the unit worked a couple of MHz lower.

**Additional Channels**

Channel 27 may be available in the blank position between channel 23 and channel 1 on the dial by installing an insulated jumper wire on the foil side of the circuit board between the terminal on the far left of the channel switch and the terminal on the far right of the switch. This modification will supply 5 volts to the vco and to IC pins 8 through 10 when the channel switch is in the blank position. Channel 27 will be 20 kHz above channel 23, or 29.070 MHz for channel 1 on 28.760 MHz. On some units, the blank will be another channel 1, but it's worth a try and, if it doesn't work on your rig, you can always take the jumper back out.

Each channel can be moved up or down 320 kHz by performing one of the following modifications. If one of these modifications is done, each channel will have two possible frequencies, one 320 kHz above the other. Thus, channel 1 in the higher position will be 30 kHz above the lower channel 23 and 10 kHz above the lower channel 27. In other words, the 320 kHz offset switch is selecting between two different bands of 23 channels (or 24 channels) each. The only component required for the modification is an SPDT switch, which may be installed in the front panel, or, to preserve the stock appearance of the radio, the function of an existing switch may be changed.

To be able to move the 23-channel band down 320 kHz, isolate pin 10 of the IC by cutting the foil on the circuit board around it. Then wire the switch as shown in Fig. 1.

To move up 320 kHz requires a little more work and is the modification I have shown in the photographs. Cut the foil on both sides of the connection to pin 7 to isolate it from ground. Then cut the foil to isolate pins 8, 9, and 10 as a group from the switch contact and from the thin strip of foil going to one end of R103, the series resistor in the B-plus lead to the vco. Install a jumper from this end of R103 to the 5-volt line at the left-most terminal of the channel switch or to the point shown in the photograph, which is just on the other side of a jumper from the terminal. If this jumper is forgotten, the vco won't oscillate. Connect the switch as shown in Fig. 2.

After the conversion has been completed, affix a label to it in an obvious place stating that the radio is not capable of operation on Citizens Band frequencies and that an amateur radio license is required to use it. The label could save a lot of embarrassment or a pink ticket from the FCC in the event a passenger riding in your car says something like "You have a CB just like mine!", picks up the microphone, and yells "Breaker 4" all over the world on 29.050 MHz.

My 13-882C on ten meters has provided quite a few contacts, mostly with stations on the west coast. My dad (Dale K9HIS) also has a 13-882C on ten, and my brother (Larry WB9BAQ) runs a 13-857B (an 882C without the noise blanker or antenna warning light) mobile with a trimmed-down CB magnet-mount antenna, working mostly stations on the west coast and southeastern U.S. What 4 or 5 Watts of AM phone will do on a clear frequency gave me quite a surprise. Who called it Ancient Mode, anyway? ■

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# PROM IDer for Longer Callsigns

## —don't be caught short

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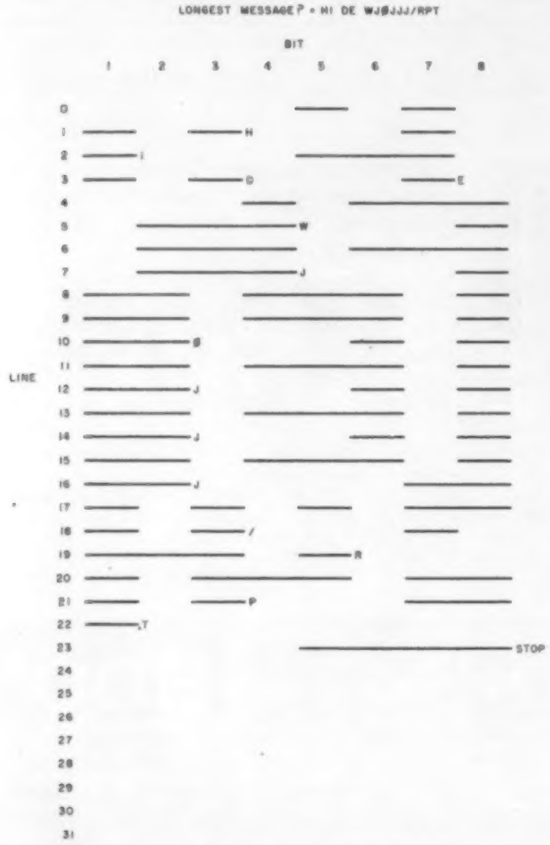
LONGEST MESSAGE? = HI DE WJ0JJJ/RPT
BIT
1
2
3
4
5
6
7
8
LINE
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
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18
19
20
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25
26
27
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29
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31
H
I
D
E
W
J
0
J
J
J
/
R
P
T
STOP

*Fig. 1. A "not-so-typical" callsign.*

*E. E. Buffington W4VGZ*
*2736 Woodbury Drive*
*Burlington NC 27215*

The Peter Stark K2OAW CW identifier has seen good service for several years now. Since it was inexpensive and easy to program, I adapted it to a plug-in configuration. (See *73 Magazine*, June, 1977.) Now it seems that a CW identifier with longer message capability is needed, due to the demise of

**Parts List**

| Qty | Description |
|---|---|
| 8 | 10k Ohms, ¼-W composition |
| 2 | 270 Ohms, ¼-W composition |
| 1 | 2.2 uF tantalum |
| 1 | 1.0 uF electrolytic |
| 1 | 100 uF tantalum |
| 1 | 10 uF electrolytic |
| 1 | 7474 flip-flop |
| 1 | 74151 parallel-to-serial |
| 2 | 7493 hex divider |
| 1 | 82S23 memory (custom bit pattern) |
| 1 | 7420 gate |
| 1 | 7400 gate |
| 1 | 10k pot, Bourns 3389W |

Circuit boards and parts can be obtained from:

O.C. Stafford
427 S. Benbow Rd.
Greensboro, NC 27401

WR repeater calls. Now we must identify the repeater with the trustee's callsign followed by RPT.

The longest of callsigns can be programmed by altering the bit pattern of the 82S23 memory. Fig. 1 lists a not-so-typical callsign to show how much room is available on the ROM.

You can do it right the first time if you remember a few rules and definitions. First, a slot is the minimum length of time between data transmissions. Now then, a dit is 1 slot high followed by 1 slot low; a dah would be 3 slots high and 1 slot low. The space between characters is 2 slots low. You should leave a few slots at the beginning to allow the transmitter to come fully on. A stop command consists of bits 5, 6, 7, and 8, all high.

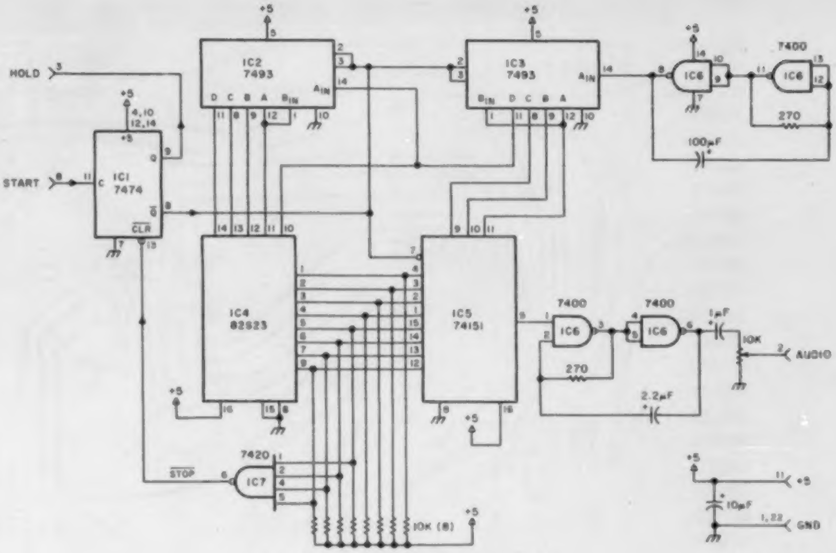

*Fig. 2. PROM CW identifier.*

The leading edge of the start pulse causes the IC1 flip-flop to change state, resulting in the hold command going high. The $\overline{Q}$ output of the flip-flop enables the two 7493 four-bit ripple counters and the 74151 parallel-to-serial converter. The 8 bits of each line of memory are thus pulsed out until bits 5, 6, 7, and 8, being high, are detected as a stop command. It should be pointed out that no other data should be on the stop line as it would never be pulsed out. A keyed CW oscillator that furnishes audio to the transmitter completes the circuit.

This ID unit plugs into the same socket (with no wiring changes) as the one shown in my June article. A logic-high pulse starts it, and during the time that the ID unit is running the hold command is high to keep the transmitter on.

A sample program is shown in Fig. 1. As you can see, this "longest call" uses only lines 0 to 23. There may be room to have even your QTH included.

Contest freaks can have several ROMS programmed for their various contests, and just plug them in when contest time rolls around. I have one programmed: "DE W4VGZ Transmitter

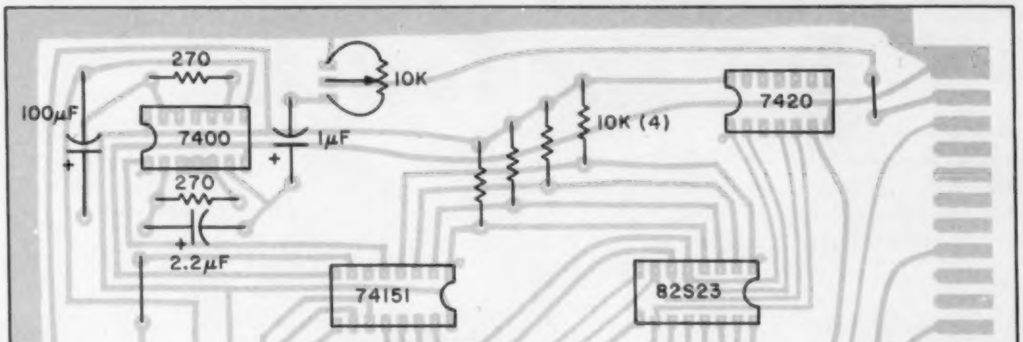

*Fig. 3. Component layout.*

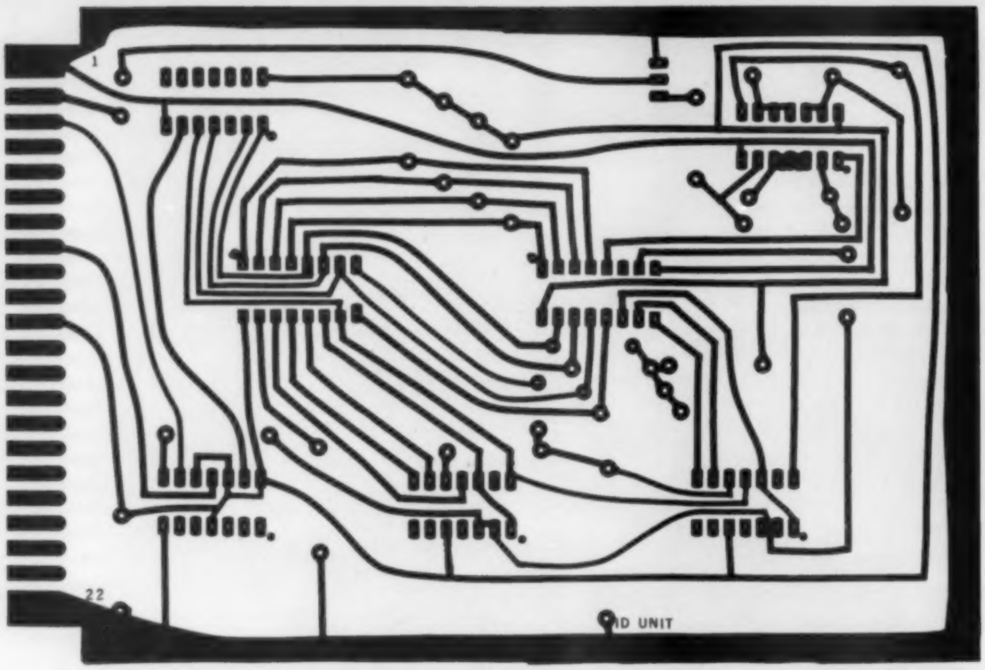

*Fig. 4. PC board.*

Hunt Hi Hi." I use a VHF Engineering 2 meter transmitter and a 555 timer to cycle the ID unit. With battery power, this unit can be hidden almost anywhere.

I will gladly correspond if you have any questions concerning this or any of the other articles I have written. Please send an SASE!■

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# The W7GAQ Key Collection

## —250 museum masterpieces

### Do you have one he doesn't?

It could be the Smithsonian Institute or it could be little Foothills Junior College in California which houses the Lee De Forest collection—John Elwood W7GAQ isn't sure which, but one of these museums, or perhaps some other one in the United States, will one day be privileged to display the finest collection of telegraph keys in the world. John is devoting his retirement years to acquiring and restoring with almost unbelievable care as many different keys as he can possibly find. One day when he deems the time right, he will donate the whole collection to the museum of his choice.

*John Elwood W7GAQ holds a small English spy key that he swapped for with an English ham. Three and one-half inch screwdriver shows the relative size of the tiny key.*

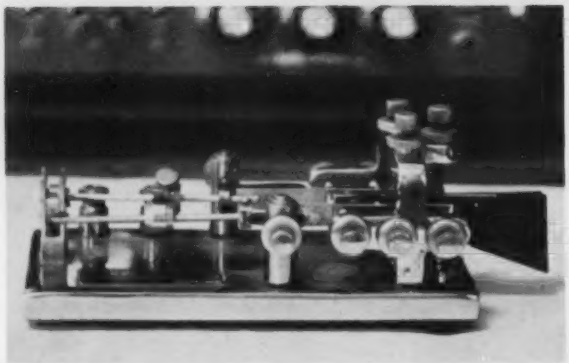
At the moment, John's collection amounts to 250 different types of keys, which he is quick to point out is not the largest collection in the world. But to this writer, who grew up in the atmosphere of the tool-and die-making trade, it is obvious that there may be no one else on Earth willing and able to spend as much as fifty hours cleaning, restoring, and polishing a key the size of a J-38, and more on a complex key such as an original Martin Blue Racer. John Elwood's keys look more like a modern elaborate sales display than an antique collection. He has been that deliberate and final in his restoration and care of them.

John was introduced to CW radio at the Army Air Force Radio School in Sioux Falls SD, in 1942, but it was several years before he got a chance to pound brass. He and his twin brother, Henry E. III, worked together running a control net system, VHF direction-finding station at Paine Field, Everett WA, in 1943. Then John went overseas with the 328th Fighter Control Squadron, 64th Fighter Wing, and for the duration of World War II he ran direction-finding equipment helping to get triangular fixes on disoriented fighter aircraft and vectoring them in to safe landings in Italy, Corsica, France, and Germany.

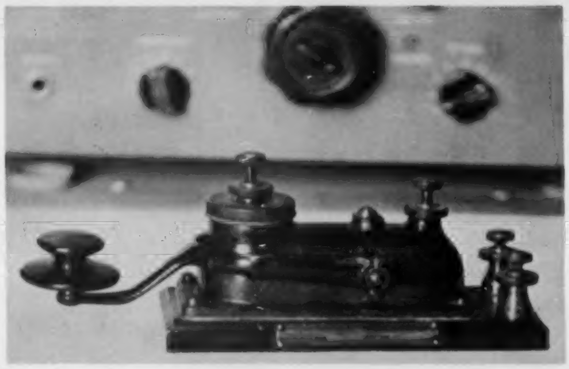
John finally got a chance to work CW as an operator in Panama, but he had to sign up for another hitch in the Air Force to do it.

"We were sent out to a place called Rey Island to work in an administrative net handling CW traffic back to Panama," John said. "It was great, and I knew I was hooked on CW for the rest of my life."

John worked CW in Greenville SC, and then got his best shot at concentrated CW operating in Operation Seminole, a joint Armed Forces field operation in Florida in 1947-48. Then he was shipped to England to operate CW at Burtonwood in the Midlands. All this time, the little contact machines that made CW communication



*Melehan Valiant, made in the 1950s. This is a favorite key of John's, because you can set the vibrating arms for both dits and dahs, the dahs being three times as long as the dits. Then both dits and dahs are made by spring action.*



*This is a 1912 Flame Proof hand key manufactured by Machinery Division, Boston Navy Yard. The key is rated at 1-2 kilowatts. It is cast iron with brass hardware.*

possible were facilitators to John. The charm of the little devices hadn't yet struck him.

The Berlin Airlift of 1949 taxed all parts of an airplane to the breaking point, radio equipment included. John was flung into a maintenance gap and had to foresake CW for a while.

"I worked my butt off repairing radio equipment on C-54s during part of the airlift," John said, "but as soon as I could, I switched back to operating CW and finished out the Berlin Airlift doing ground-to-air communication with weather ships over the North Sea."

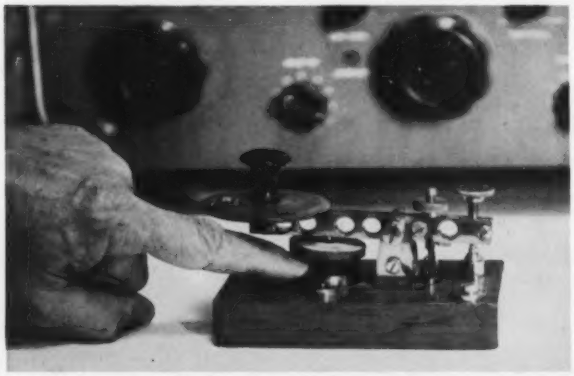
John wrapped up his Air Force career as ROTC radio instructor at Ohio University. Then he switched to the Federal Aviation Agency, from which he retired when he was Facility Coordinating Officer at the Los Angeles Air Route Traffic Control Center at Palmdale CA.

It was at this final duty in California for Uncle Sam that John finally got swept away by the charm of telegraph keys—and it took a woman to gather him up. Louise Moreau, now W3WRE, was living in California in 1971 and working CW with her WB6BBO call. Since she was a prime collector of telegraph keys, she responded to a call from the Lancaster Radio Club to speak about them. John sat in the audience and listened and found himself captivated by the love and enthusiasm that Louise expressed for her keys.

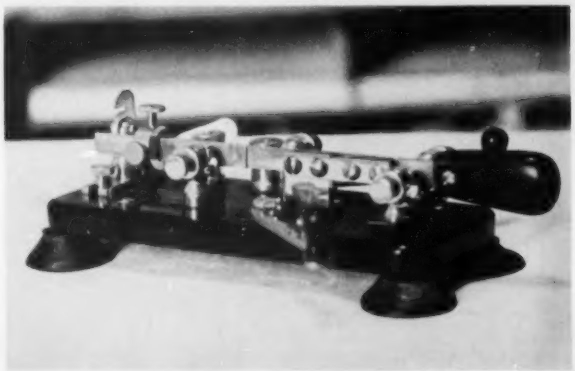
"She spoke with such excitement and interest," John said, "that I couldn't help wanting to become a key collector. When I left the room that night, I was a collector."

A friend gave John a big Japanese key and, as a gesture of fellowship, John cleaned it up in one of his now-routine fifty-hour restoration projects, drove down to Altadena, and presented it to Louise Moreau. Louise showed him her key collection representing twenty years of effort and encouraged him to get on with his own collecting. This he did, and he and Louise have been friends and correspondents ever since.

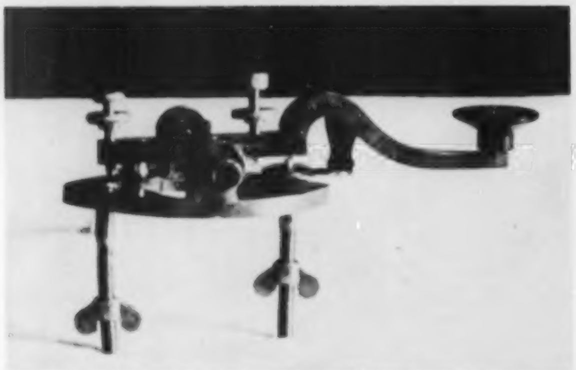
John's wife Edie bought him the first key for his own collection: a Boston Fire Alarm key which she got from J.J. Glass Surplus Radio in Los Angeles. John went to work on the key, soaking and scrubbing and polishing until every speck of foreign material had been removed. That key amounted to free rein for John. He hit the highway at every chance, scouring the whole of the west coast for telegraph keys. Edie caught the travel bug, too, and went on nearly every trip



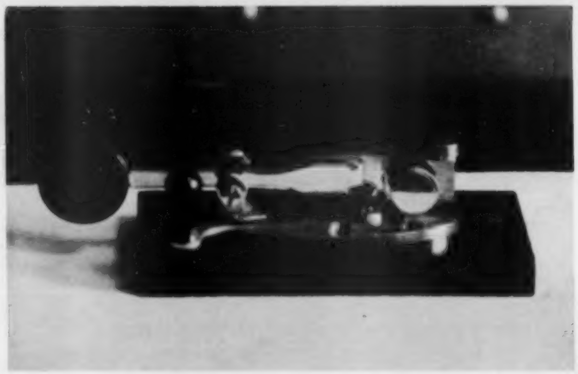
*John Elwood's well-used keying finger points to oil well on the Ducrete and Roger (Paris) oil break key. Oil dampened the spark of spark gap transmitters. The key was a gift from Ed Rasner W2ZI, Trenton NJ. The gear in the background is John's R-391 Collins receiver.*



*This is a Signal Electric semi-automatic key that can be used as a sideswiper by dropping a locking arm over the vibrating arm and closing the arms of the contact terminals.*



*This G.M. Phelps "camelback" leg key is from the 1850-1860 era. The inventor, George M. Phelps, was the chief of Western Union at Utica NY. It was he who introduced the spring adjustment for this type key. Brass "legs" were inserted through holes in top of desk and the key was tightened down with brass wing nuts.*



*Here is a J.H. Bunnell & Co. "Sideswiper" double-speed key. It requires only half the movement of an ordinary key. Advertisements claimed it eliminated muscle cramping. John turned down $200 offered for this key when it was on display at the ARRL Convention in Hollywood. In the background is an RM18 US Signal Corps Type 5007A British Air Ministry control unit, part of the SCR-575 VHF/DF unit of the type John used in World War II.*

with him.

"If you see any kind of antique store, junk shop, or radio store between Oceanside CA and Vancouver Island, Canada, that looks like it might have a telegraph key in it, we've been there," John said. "And we've dug up a lot of keys worth saving."

It wasn't long before John's friends heard about his key collecting and, respecting his zeal and purpose, they kept their eyes open for keys. About twenty of them have had the satisfaction of contributing to his collection.

Once, in Portland OR, John and Edie went into a little, out-of-the-way antique shop, and what they found made their trip a success. The proprietor told them he didn't know what he had, so they should go into the back room and take a look.

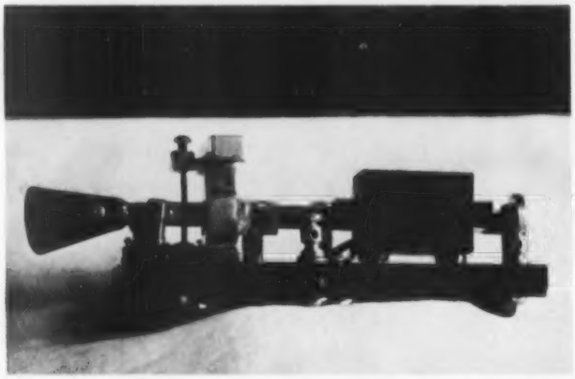
"We looked," said John, "and found big boxes with an antique radio station in them, cat's whiskers and all. But since I don't collect radios, we picked out two camelback keys and a Marconi wireless antenna knife switch built by Cross and Hines, and we bought them and left."

John wrote a friend in California about the old radio station, and the friend went up to Portland and bought it. He got an extremely rare Marconi loose coupler, a Clapp-Eastham one-half-kW spark transmitter and receiver, a marble base detector, a Colby loose coupler, and some United Wireless gear.

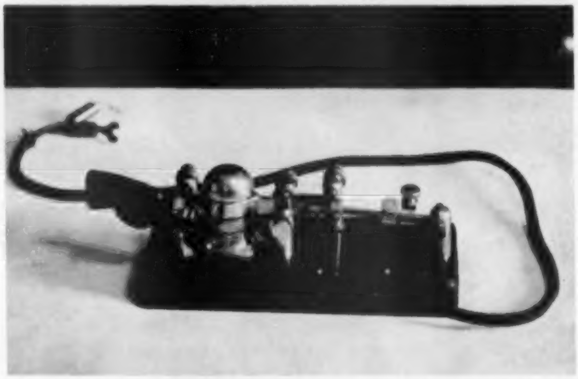
Once, at the Rose Bowl flea market in Pasadena, Edie, who John swears is clairvoyant regarding radio gear, had a strong feeling that this would be John's day. She was right. John found a man with a wooden box of telegraph gear for sale for fifteen dollars. Among the contents were a Martin Vibroplex, a Boy Scout training key, three Menominee leg keys, a Bunnell straight key, and four Bunnell sounders. John paid the man the fifteen dollars and picked up the box to leave.

"Hey," said the man, "don't take that box. It doesn't go with that other stuff."

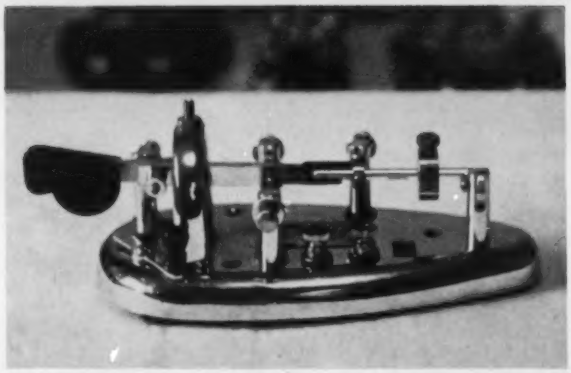
As collecting became more difficult, John began advertising in the maga-



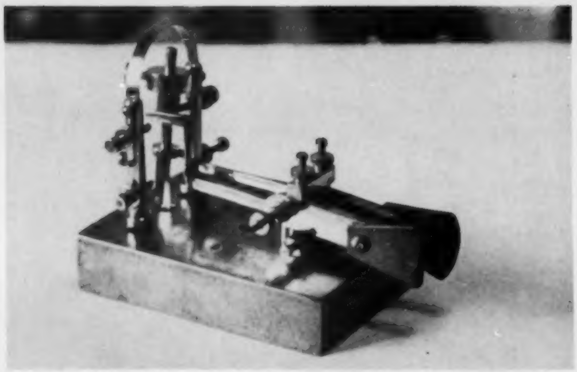
*This Electro-Bug, made by Electro Mfg. Co. of San Francisco, has a line magnet and works like a doorbell buzzer, attracting the vibrating arm and then breaking the contact. "You can hold the paddle over and it will make dits all day long," says W7GAQ.*



*This Horace G. Martin Rotoplex key built for the US Army Signal Corps during World War II has a black crackle finish on a steel base and is mounted on a quarter-inch rubber mat.*



*This chrome-steel teardrop base semi-automatic key was made by T.R. "Ted" McElroy in Boston. McElroy is credited with the Morse code receiving speed record of 75.2 wpm set in a tournament at Asheville NC on July 2, 1939.*

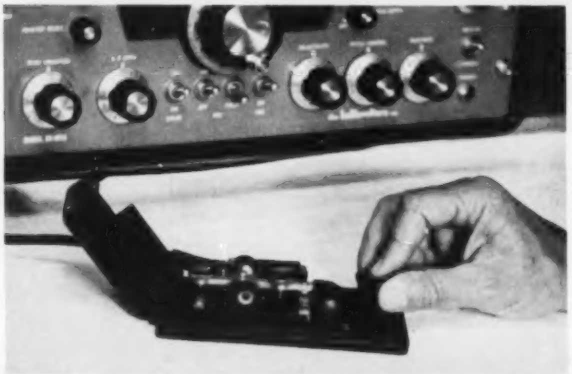


*This is an Australian PMG vertical semi-automatic landline key made for the Postmaster General Department. The PMG controls all communications in Australia.*

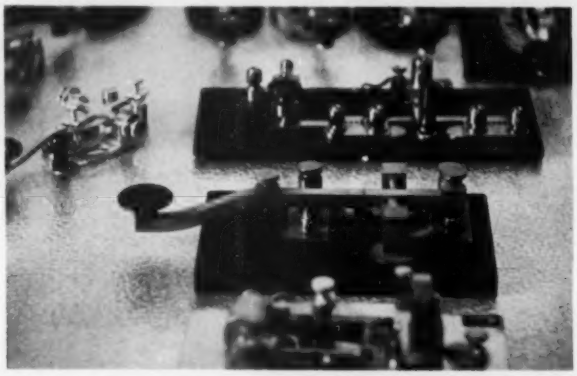
zines of England and America. Half the world reads English and American magazines. John found that the foreign countries have collectors, too, and they were interested in swapping keys. Since John had duplicates of some types, he made mail-order agreements with several hams and, as a result, he got some interesting German, French, and English keys. Recently he has made contact with a doctor in Belgium who collects keys, and they have worked out a mutually worthwhile swap agreement. One ham in Australia has traded nine keys to John.

When John gets a key that is in rough condition, he applies penetrating oil to frozen or rusted screws, nuts, and moveable parts. Once the parts have loosened, he disassembles the key completely and submerges all metal parts in carburetor cleaner to remove dirt and lacquer and get down to base metal. Then he makes a cleaning potion of one-third cup each of baking soda, white vinegar, and ammonia, and one cup of very hot water. He soaks all brass parts in this solution for twenty-five minutes, polishes them with Dupont chrome polish, washes them with soap and water, and dries them. Then he finishes up the brass with Happich Simichrome polish (German) and washes it with hot soap and water. On the steel parts, he uses steel wool, working down to four-ought grade. He uses taps and dies to restore threaded holes and screw threads. He has chrome- or copper-plated parts re-chromed or re-coppered. If a part is missing, he hunts for it until he finds it. Then he reassembles the key and puts it into his display case. Because of the time-consuming job of keeping brass keys polished, John is now thinking of coating them with lacquer.

John has an almost clinical attitude toward his keys—his patients. There they are in all their sparkling beauty. He has taken them in, analyzed their difficulties, repaired them, and stitched them back up again as good as when



*Here is a German Baumuster T1 military key of the 1930s. "This is my favorite hand key because the adjustments are precise and the concave knob gives it a good feel," says John Elwood, who purchased the key from Louise Moreau W3WRE. In the background is John's Hallicrafters SX-101A receiver. That's John's precise fist in action.*



*The thick-base key in the foreground is the famous "Boston" key made by Class-Eastham Co. This key is called a "Cadillac Class" key of the spark era by Louise Moreau. The key was designed for luxury liners and the yacht trade, and every amateur wanted one. Behind it is a Boston Fire Alarm key, and to the left is a recent copy of the T.R. McElroy Professional Hand Model Key made by Daniel L. McElroy, grandson of the record holder, who is making them in honor of his grandfather. Out of focus in the foreground is a Mecograph semiautomatic key once headed for the Smithsonian until its owner, Howard Lorenzen W3BLC, heard of John Elwood.*

they were created. Now it's time to think of them as healed. They are well again, and that's a fact. Now he must get on with the business of locating and repairing others. He feels he must be successful before collectors with only a monetary interest in keys have collected them and taken them out of range of the ham fraternity.

John wishes he could swap keys with more hams in this country and abroad. He'd especially like to get the miniature Bunnell key and sounder once used as watch charms. He'd also like to get a Vibroplex vertical bug. He never sells keys, though he has been offered as much as two hundred dollars for a small sideswiper key, but he will be happy to trade and will work out satisfactory trade agreements.

Not once did John speak of "my" collection. He seems rather to consider the keys as the property of everyone. His responsibility seems to him to be an almost sacred duty to get the keys and make them new again so that the world will be able to see them and know what pounded out man's joys, sorrows, successes, and failures during a century and a half of incredible progress in communication.

Also, John is preoccupied with that ultimate decision he will one day have to make: Which museum will display the keys to the best advantage and take the best care of them?

Whichever one he picks, that museum will some day find itself the keeper of a remarkable and interesting collection.■

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# Proper FM Transceiver Adjustment

## —good club project

**In search of the crisp signal.**

Anyone who listens to the great number of rigs on two or six meter FM these days may wonder why there is such a great variation in the quality of signals they hear. One HW-2036 may sound clear and crisp, while the next may sound distorted, especially on audio peaks.

In almost 100% of the cases, the problem can be traced to either overdeviation or off-frequency operation, and sometimes a combination of both. Unfortunately, most hams are quick to notice low audio, but few seem to point out excessive audio.

If you have been active on SSB or AM, you may ask why these two items are so important to maximum range when using the FM mode. If you take a moment and glance at Fig. 1, we will try to show you.

Fig. 1 shows an FM transmitter on 146.520 MHz with a 1000-Hz audio tone deviating the carrier frequency ±4.5 kHz, and being received by a receiver with an i-f passband of ±5 kHz. (Please note that an i-f filter selectivity curve is not as sharp as depicted.) As one can see, the on-frequency signal, with its 4.5 kHz of deviation, fits perfectly through our i-f filter where it enters the FM detector and becomes a good clean signal at the speaker.

Now let's move the transmitter off frequency by 3 kHz and see what happens. This may not seem like any amount of error to be concerned about, but look at Fig. 2.

Since the receiver discriminator, or some form of FM detector, only converts to audio what passes through the i-f filter doorway, one can rapidly see why a good signal can sound distorted when it's only 3 kHz off frequency. As Fig. 2 shows, over 60% of the transmitted audio on the high side is being chopped by the filter and over 60% of the low-side audio is attempting to be detected on the high side of the carrier frequency. As a result, audio distortion occurs.

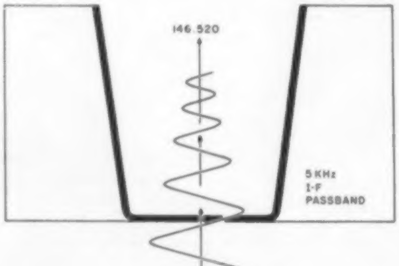

Fig .1.

You may ask why a weak off-frequency signal is more noticeable than a strong local signal. The true selectivity curve of the i-f is such that strong signals brute-force their way through the filter, thus not affecting the audio quality as much. The selectivity of the receiver is directly proportional to the strength of the signal being received. This does not mean that if you are close to the repeater your frequency is not as critical. Remember, your off-frequency signal could be affecting the user of the next channel up or down.

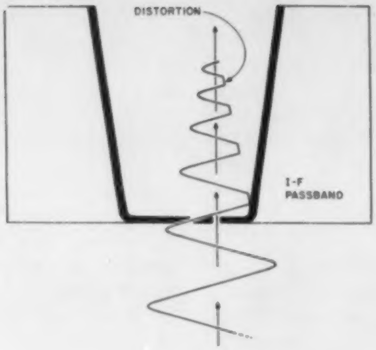

*Fig. 2.*

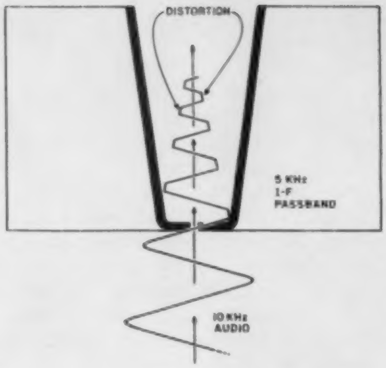

*Fig. 3.*

The only solution to the above is to adjust your transmitter back on frequency, or reduce your deviation 60% by backing away from the mike. The latter is only a poor temporary cure.

**Deviation**

Since the receiver i-f passband can accept only those signals that transmit within its 5-kHz limits, we must make sure the transmitter does not exceed this amount.

If you look at Fig. 3, it is very apparent why overdeviation (±10 kHz) will produce highly distorted audio.

At a recent tune-up session at the Kitchener-Waterloo Amateur Radio Club, some rigs were found to be deviating in excess of 15 kHz. If you visualize this amount of audio trying to find its way through a 5-kHz filter, it is no wonder why some signals were almost unreadable prior to the tune-up clinic.

With the number of repeater frequencies already used in the Metro areas, the repeater councils have adopted a plan to split the channels and create new ones every 15 kHz, thus placing a new repeater pair between each existing one. Because of this split, it is rapidly becoming very important that our deviation be kept at 5 kHz maximum.

Fig. 4 shows what happens when an over-deviating signal is placed on the air adjacent to one of the new channels.

This same adjacent channel interference can occur if the transmitter is off frequency, since it allows part of the signal to fall into the passband of the receiver using the next channel up or down.

The new band plan adopted for use with these new split or "tertiary" frequencies will minimize some operator error in the following way. All *new* frequencies *above* 147.000 will use low inputs and high outputs (reverse of the standard high in, low out). This will mean that off frequency and over deviation on a repeater input will not bother the adjacent input, only the output, so you will only get pins in your coax from your neighbors, not the complete repeater group. This will put all repeater operators in a position where they will be forced into keeping the peak deviation below 5 kHz and off-frequency operation to less than 1 kHz. If they wish to meet current DOC (Department of Communications, our FCC) commercial specs, they should keep within 5 ppm or 735 Hz at 147 MHz.

Don't feel you will have to run out and buy a new super-selective rig with these new splits. They will be issued about 50 miles away from adjacent channel repeaters and should not cause a problem except on the older wideband rigs. Current DOC guidelines are 35 miles between tertiary frequencies, with some as close as 5 miles with no interference problems, so don't get upset about the new splits.

**Frequency Adjustment**

The best method for frequency adjustment is, of course, with a counter capable of 150 MHz. A counter capable of only 10-15 MHz can also be used by reading the actual oscillator frequency and calculating the frequency by multiplying by the number of times the rig multiplies. For example, a GE Prog Line using a 6-MHz transmit crystal would have an oscillator frequency of 6.1050 MHz when producing a 146.520 output.

If no counter blesses your ham shack, have a local ham lend you his receiver that is known to be on frequency and uses a discriminator for FM detection. This type of detector, when properly aligned, produces a voltage relative to "0", either positively or negatively proportional to the amount of off-frequency operation. You simply adjust your transmitter trimmer until the discriminator reads zero on the meter. A lot of the new rigs use ratio detectors, or quadrature detectors, which cannot be used to determine receive frequency unless it is beat against an accurate i-f frequency generator, e.g., 10.7 MHz.

Another method to use if no counter and no receivers with discriminators are available is to transmit a very weak signal to a known on-frequency receiver. Simply adjust your trimmer while talking into the mike. The point where your audio has the least distortion should be very close to frequency.

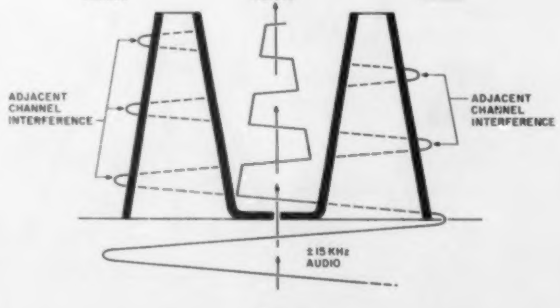

*Fig. 4.*

### Deviation

Deviation is normally set by the factory before shipping. Unfortunately, 90% of the rigs that get on the market appear to be set at 7.5 kHz. Almost all users of these rigs sound much better when they back off from the microphone. As we all know, within a couple of transmissions, we tend to crawl back into our normal mike habits. The only solution is, of course, to adjust the deviation as set out in the manufacturer's instructions.

To set this control properly, one needs a calibrated deviation monitor which very few hams, including myself, own. The next best way is with a weak signal into an on-frequency receiver, adjusting the deviation for best audio. Have the person adjust his squelch at threshold with no signal. When you transmit, try whistling. If the squelch closes, you are exceeding the bandwidth of the receiver and should back off a bit until the squelch does not close on peaks. It is very important when using this method that the signal be just full quieting, .7-1 uV.

The commercially accepted level for adjusting FM deviation is 4.5 kHz of audio. This is measured with a 1000-Hz tone driving the transmitter audio limiter stage into limiting.

So, as you can see, one does not have to mortgage the house to invest in test equipment in order to have a good-sounding signal on 2 meters. Most of these adjustments, if set once, require very little attention. Because of this, there are many generous hams who have the equipment and don't mind helping out a ham in trouble. ■

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***QST Magazine,***
***"Product Review",***
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# Dual-Band Smokey Detector

## —Super Scooper does it all

**The battle goes on.**

The "Smokey Detector," described in the 1976 Holiday issue of *73*, has been the subject of much mail received at W1SNN. Many have asked if it could be used on the higher frequencies found with newer types of radars which have been designed to improve entrapment techniques and decrease confidence in Smokey Detectors.

The author has learned of new methods used to deploy obsolete police radar along highway ranges used for surveillance. Newer radar is used in conjunction with this method, which is known in police circles as "seeding." The older radar units are set up and left unattended so that they "illuminate" stretches of highway for many miles—depending on the number of "seeds" that are used. Most of those units operate on 10.525 GHz in X-band.

The newer radars, usually operated from a fixed position, are hand-held and triggered only when the device is pointed at a particular stream of traffic. The purpose of seeding is to keep the Smokey Detectors activated and, therefore, cause drivers to slow down. Confidence is soon decreased in the Smokey Detector, however, and the unsuspecting driver is trapped by the hand-held device. Yes, it works on X-band, too, but too late for a detector warning because the speeder has moved right into trigger range.

But that isn't the only technique used. How about this one: As before, seeding is used. Radar which has been designed to be used in vehicles while moving is employed. These units have a device that arithmetically removes the vehicle speed, allowing the officer to pursue and record the speed of the car being chased. Here again, the police car can depend upon the seeds to keep Smokey Detectors operating, and even when the police come into range of vehicles using detectors, they can follow without detection. The new radar operates in the K-band region. Most of the older radar detectors will not receive at this frequency range; again, confidence is lost.

These techniques are used by large municipalities and state agencies for the most part. They can afford to maintain the antiquated equipment for seeds. Others will be adopting them, however, because of newer seed equipment that is being manufactured by several companies at prices which can fit smaller budgets. The newer units are simply a small oscillator and battery supply. The oscillator will feed an antenna that floods an area with the oscillator's signal. They can be left unattended, fastened to street signs and stop-go signals. Other radar units that promise greater control for police agencies are in the works; the war is still on.

What can we do with our radar detectors? Well, we can update them to detect the newer frequencies and learn how to use the older ones to be sure that we are detecting an active radar and not a seed. It is not too hard to manufacture detectors that are sensitive enough to detect a seeding and radar entrapment, and thus provide a warning that both are being used, or to warn that just a higher-frequency moving radar is activated. Look at the block diagram of a dual warning system which accompanies this article.

A circularly-polarized horn coupled to a circular waveguide is coupled to a pair of crystal detectors. The detectors are mounted in cavities which support the frequencies of interest. The larger of the two cavities is tuned for the X-band frequency, 10.525 GHz, while the smaller one has a step ridge mounted into its E-plane coordinate. The step ridge performs as a tuning device that allows the smaller of the two cavities to work over the 16.5- to 26.5-GHz range. There are several frequencies used in this range for hand-held and moving-surveillance radar units.

Coupling to the circular waveguide is accomplished by careful placement of the two detectors which are mounted in rectangular waveguide to provide coupling to the circular mode.

Two preamplifiers, one for each waveguide-mounted detector, amplify the signal—which is the dc component of the detected signal. The amplified signal is passed through a CMOS switch which serves as a signal modulator.

Each of the switches has its own driving oscillator. An oscillator at 1 kHz modulates the X-band-detected signal, and another at 400 Hz serves as the K-band signal modulator.

The outputs of the two modulators are summed at the input of an audio amplifier that drives a loudspeaker.

The resulting warning signal will be two-toned when both X- and K-band radar units are detected. If just the X-band detector is activated, the higher-pitched tone of the 1-kHz oscillator will be heard. Likewise, the 400-Hz signal will be heard when a K-band signal is detected. When both are on, it is very likely that you are in an entrapment area which is well seeded. Beware when the higher-pitched tone stays on for long periods. If it is on for over 4,000 feet of driving, you are probably in a seeded area. If the signal continues, slow down and watch for your friend in blue.

The circuitry illustrated here is straightforward audio construction and can be built on a small board using flea clips or wire-wrap. No special attention is required. The completed board must be mounted so that the leads that connect to the detector outputs are short—that is, not over six inches long. Several adjustments to the electronics are required and will be described below.

The hardest part of the construction of the Super Scooper is its antenna and circular waveguide. In the original Smokey Detector article, instructions were given on how to construct the horn antenna. This was the subject of many inquiries both as to its beamwidth and gain and relative to variations from the given dimensions. First of all, the gain of the antenna is approximately 14 dB over a reference antenna that provided a 3-dB gain standard. The gain standard was determined in a laboratory using a section of circular guide terminated in a matching impedance to a standard signal generator. A similar antenna was used with a detector and spaced one meter from the generator gain standard and three meters above the ground. Once a level was determined by setting the signal generator attenuator to produce a full-scale deflection on the detector indicator, the new antenna used on the Super Scooper was substituted for the transmitting horn, and then the attenuator was readjusted to produce the same full-scale reading as with the reference antenna. The attenuator difference was 14 dB at 21 GHz and 17 dB at the X-band frequency.

Since most amateurs will not be able to duplicate these dimensions, a pattern shown in the drawings has been laid out so that it can be closely duplicated. Several antennas were constructed and measured, and variations from the values given were not worth mentioning. The dimensions were deformed from true circular to a shape which occurs when the seam is soldered. Not a true circle, the variation in gain wasn't worth the trouble to measure. It is apparent that that would take quite a departure from a true funnel shape.

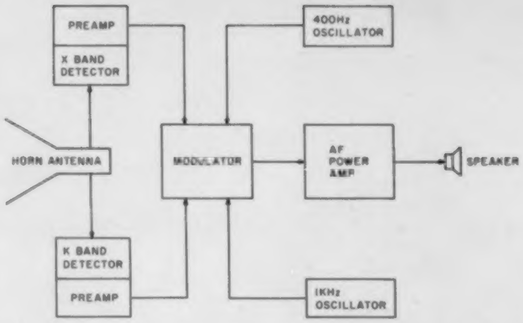

*Fig. 1. Block diagram, Super Scooper Smokey Detector.*

The beamwidth was measured, and it required a considerable amount of time to determine that it was a circular beam of 9 degrees. Variation from a true funnel shape does distort the beam considerably, so care in achieving the cone shape should be exercised. The beamwidth was measured on an antenna range at the same laboratory, using a quality of range equipment probably not available to most amateurs. A nine-degree beamwidth is very similar to that of most circular antennas used on police radars and should intercept most radiation from them.

To construct the antenna, it is necessary first to acquire a piece of copper flashing sold in most hardware stores. (Brass can be used but should be thin so that it is easily worked.) The sheet should be at least 10″ x 6″. With a compass, lay out a 9-5/16″ circle and, from the same center, scribe the second ½″ circle. (See the drawing.) Outside of the circle leave enough metal so that the tooth-like section can be cut and bent. Cut the sheet with tin shears and flatten out all bends and dents acquired in the cutting procedure. Make sure that the tooth-like cuts are bent at right angles to the sheet, and then lay it aside.

Next acquire a piece of construction paper with the same dimensions as the flashing sheet. Lay out the same dimensions as before, but forget the tooth-like part—just cut a smooth ½″ half-circle. Cut out the complete sheet so that it can be glued at the seam tab. Now you should have a cone that has a mouth 3¾″ in diameter and a length of 4-1/16″. The opening at the rear should be about ½″ in diameter.

Make up about two cups of plaster of paris that is nearly dry but easily molded, and fill the cone so that a substantial amount of it protrudes from the ½″ hole. Shape the plaster so that the cone is as rounded as possible, and set it aside to completely harden. This form will serve as a mandrel for the metal horn when soldering its seam. Simply bend the metal around the form and hold it in place with rings placed at several points on the cone. Solder the seam. Shape the metal and set it aside until the circular guide is finished.

The circular waveguide is made from a section of ½″ water pipe 3″ long. Lay out the dimensions shown in the drawing. Measure up along the outside

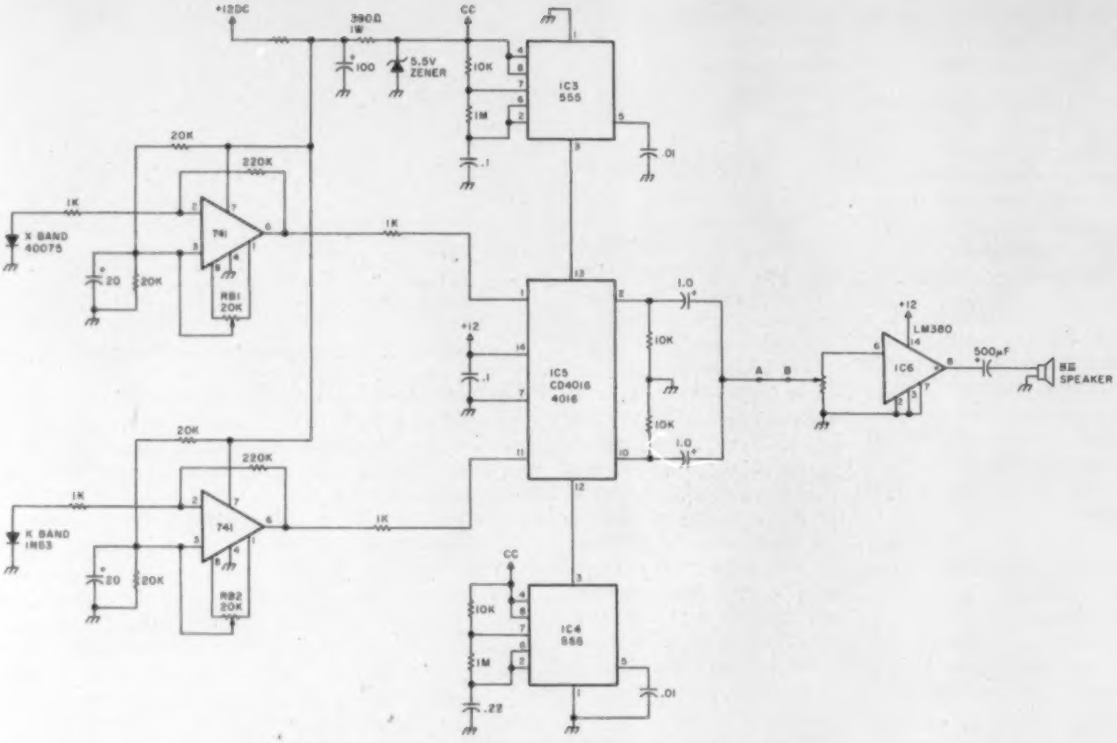

*Fig. 2. Schematic, Super Scooper Smokey Detector.*

of the pipe and make two marks to indicate the width of the cuts. They will be .250″ wide and will support the K-band waveguide when soldered in place. Make this cut so that the .250″ x .500″ guide sits in place in such a way that edges of the guide mate with the H-plane walls of the K-band waveguide. Remove all burrs. (The cuts are easily made with a hacksaw, but can be better if done by a friendly machinist and a milling machine.)

No other cuts are needed in the circular waveguide, but its length is very important. The ends should be square and free of burrs. It also would be to your best advantage to clean the pipe inside and out with steel wool so that solder will easily tin the metal. Set the circular waveguide aside for now, and proceed to drill the holes in the E-plane dimension of each waveguide section.

Lay out the holes on the X-band guide as shown in the drawing. The crystal detector mounting for the 40075 X-band detector should be a 3/16″ drilled hole on the centerline of the E-plane. Mark a point 11/16″ from the smoothed end of the guide. Carefully centerpunch a point for the drill and drill through both walls of the guide. Open one hole to 5/16 of an inch. Place a section of 3/16″ pipe or tube, 3/16″ long, into the other hole.

(This pipe is found in most model shops; it is brass tubing used in model construction. If you try to buy it at a metal dealer you will pay for a lot more than you need since there it will be a one-foot section you will have to purchase.)

Solder this small piece in place so that it is just even with the inside wall of the X-band guide. This serves as a connection for the small end of the X-band diode. Now lay out the other two holes in line with the 5/16″ diameter hole, drill them, and tap for 4-40 threads. Next, drill holes located 3/4″ from the B tuning hole through both walls. Use a #36 drill. On the same side of the guide wall as the detector holes, open the #36 hole to a 5/8″ diameter. Tap the remaining #36 hole for 6-32 threads. Deburr the hole inside and out. This hole is used to couple the circular guide to the X-band detector. Mount two 4-40x½″ brass screws in the holes marked B and C and use nuts as locks for these screws. A ½″ brass 6-32 screw and nut is used for the same purpose at point A.

Next, lay out the hole required on the K-band waveguide. This hole must be on the centerline of the E-plane side of the waveguide. Very carefully centerpunch a point 5/16″ from a smoothed end of the guide, and at this point drill a .187″-diameter hole through one wall of the guide. Deburr on each side of the hole, as on the X-band guide. Mount a ¼″ long piece of copper tube .250″ in diameter. The ends should be deburred inside and out. This piece of copper serves as the outer part of a capacitor and choke for the K-band 1N53 detector diode. The copper tube and the diode are coaxially mounted, so it is necessary for the tubing to be aligned so that the hole in the guide is exactly in the center.

The next step is to lay out the 1/8″ thick piece of brass which will serve as the step ridge for the K-band waveguide. Lay out the steps, cut with a hacksaw, and smooth with a file. The steps are set so that the bandwidth of the K-band cavity is quite broad and will cover many of the frequencies used by K-band radar. Departure from the dimensions given will decrease the sensitivity of the Super Scooper, so

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try to stay as close as possible.

Next, in the middle of the second step from the top of the structure, drill a hole with a number 60 drill. This hole must be on the centerline of the step, and fall 5/16" from the end of the structure so that it will align with the hole in the waveguide when the structure is in place. Remove the center conductor from a BNC chassis jack (UG-1094/U). Cut off the solder section so that the pin is .250" long, and file it smooth. Insert the cut end into the number 60 hole and carefully solder into place. (Take care that solder does not fill the flutes on the opposite end.) This pin serves as the connection to the center conductor of the 1N53 diode—a coaxial diode that has a pin connection.

Slide the step ridge section into the waveguide so that the pin is in the center of the .187"-diameter hole. This ridge section must lie on the center line of the inside (E-plane) of the guide. (It may be held in place by wood wedges while it is soldered on the bottom to the waveguide wall.)

Now solder the X-band and K-band detector mounts in place. The 2" circular waveguide should be inserted into the 5/8" hole drilled into the X-band guide. The pipe should be just through the waveguide so that it is parallel with the inside wall of the guide. Solder in place. Also solder a ½" x 1" cover plate on the open end of the guide. Install the K-band detector mount and solder in place. Add a cover plate to the open end of this mount, also.

Now slide the horn over the end of the pipe and press down the tooth-like flaps so that they lie flat on the pipe. Match up the end of the horn with the end of the pipe and solder the flaps to the pipe. Use solder sparingly on the inside joint and make it smooth and clean, but build up the solder on the outside to strengthen the joint. Gussets may be added to the outside of the horn and pipe, if desired.

Install the X-band diode by first slipping over the diode a ¼" solder lug and a ¼" shoulder washer. The shoulder should face the small end of the diode. Install a 1N53 diode in the K-band mount by first wrapping the diode outer sleeve with one wrap of Saran Wrap, which serves as the dielectric for the choke capacitor. (For the purist: Use a single wrap of 1 mil mylar™.) When this diode is installed, it should be pushed into the mounting hole carefully so that the insulation is not scored. The center pin of the diode should engage in the hole of the pin jack mounted on the ridge. A diode clip should be used to connect to the shank of this diode where it protrudes from the copper tube. Use a razor blade to cut away excess Saran Wrap or mylar™ so that the clip can make contact with the outer diode sleeve.

The diodes may now be connected to the points indicated on the schematic diagram. Care must be used in making these connections. Be sure that there is no power in the circuitry. Do not solder to the diodes; solder to the lug—and then only briefly for the X-band detector diode—and do not solder at all on the K-band diode. Use a diode clip or make a small clamp that contacts the diode sleeve.

Assuming that all of the electronics has been constructed as shown in the schematic diagram, it is now time to test individual circuits.

The input circuits to the LM380 audio amplifier can be used as an audio circuit tracer by disconnecting the jumper marked AB at the input of the volume control. Connect a .01 capacitor to this point and use it as a probe to detect the 1-kHz tone at the output of IC3, pin 3. Be sure the audio volume control is half open, as the tone should be present at this point. Also, you should be able to detect a 400-Hz tone at pin 3 of IC4. If this test checks out OK, reconnect the jumper at AB. Now, probably, you will hear both tones. If so, disconnect pin 3 of IC4 and adjust balance pot RB1 so that the tone nulls out. Reconnect pin 3 of IC4 and then adjust balance pot RB2 until the other tone disappears. This completes the electronic adjustments.

The rf adjustments require the use of two signal generators, or your friendly police car. Apply a signal to a horn, or other radiator, from an X-band signal generator, point the Super Scooper antenna toward the generator, and use a fairly strong signal from the generator. Adjust tuning with screws B and C alternately for the strongest tone from the speaker. To use an indicator, connect an ac voltmeter across the speaker leads and adjust the screws for the greatest output. Now turn off the X-band signal generator and radiate a signal from a K-band generator at 24.5 GHz toward the Super Scooper. Adjust screw A for the strongest signal.

The adjustments are now complete, and so off to the highway! You may find that radar used at airports and military bases will be detectable. These units are putting out very strong signals and will saturate your Super Scooper. It will take only a very short time to learn how the Super Scooper works.

No description of the packaging of this device is given here. It is sufficient

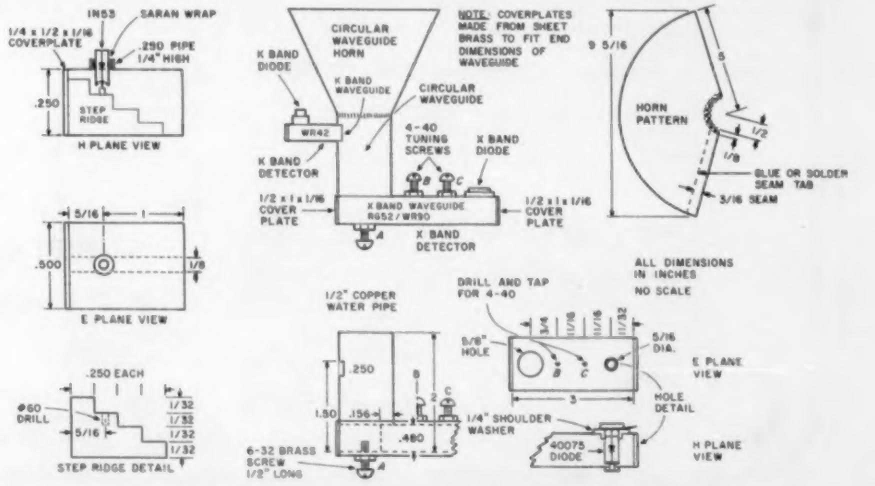
IN53
SARAN WRAP
1/4 x 1/2 x 1/16 COVERPLATE
.250 PIPE 1/4" HIGH
.250
STEP RIDGE
H PLANE VIEW
5/16
1
.500
1/8
E PLANE VIEW
.250 EACH
#60 DRILL
5/16
1/32
1/32
1/32
1/32
STEP RIDGE DETAIL
CIRCULAR WAVEGUIDE HORN
NOTE: COVERPLATES MADE FROM SHEET BRASS TO FIT END DIMENSIONS OF WAVEGUIDE
K BAND DIODE
K BAND WAVEGUIDE
CIRCULAR WAVEGUIDE
WR42
K BAND DETECTOR
4-40 TUNING SCREWS
X BAND DIODE
B
C
1/2 x 1 x 1/16 COVER PLATE
X BAND WAVEGUIDE RG52/WR90
1/2 x 1 x 1/16 COVER PLATE
A
X BAND DETECTOR
9 5/16
5
HORN PATTERN
1/2
1/8
GLUE OR SOLDER SEAM TAB
3/16 SEAM
ALL DIMENSIONS IN INCHES
NO SCALE
1/2" COPPER WATER PIPE
DRILL AND TAP FOR 4-40
.250
1.50
.156
2
.480
6-32 BRASS SCREW 1/2" LONG
3/4
11/16
11/16
11/32
5/8" HOLE
5/16 DIA.
E PLANE VIEW
3
HOLE DETAIL
1/4" SHOULDER WASHER
40075 DIODE
H PLANE VIEW

*Fig. 3. Super Scooper Smokey Detector, construction details.*

to say that the whole device can be enclosed in a plastic package—including the horn antenna. It is better to keep these devices out of sight, since confiscation of them does occur in several states. My unit lies on the dash, looking through the window. It is not a pretty device and does not look like much more than a batch of pipe and a funnel. Eventually, I will enclose it in a fog light to be mounted on the front bumper.

The diodes used are available from several microwave semiconductor manufacturers. Most of them cost too much for the average constructor, so the best bet is to get them through distributors. Names of manufacturers who supply either direct or through distributors appear in the reference at the end of this article.

The requirements for signal generators to tune up this unit must be left to your ingenuity. The possibility of tuning up on police vehicles is not too great, but it is a possibility. If generators are not available, it always is possible simply to try out on the road in hopes that you will find a seed trap to tune up on. Or perhaps you could build a generator. In any case, lots of luck!■

**References**

"Mobile Smokey Detector," S. M. Olberg W1SNN, *73 Magazine*, Holiday issue, 1976.

"A Complete X-Band Transmitter," S. M. Olberg W1SNN, *73 Magazine*, August, 1978.

Note: Microwave diodes used in this equipment are available from Alpha Industries, Sylvan Rd., Woburn MA 01801, Parametric Industries, Inc., 742 Main St., Winchester MA 01890, and Microwave Associates, South Avenue, Burlington MA 01803.

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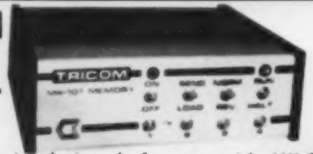

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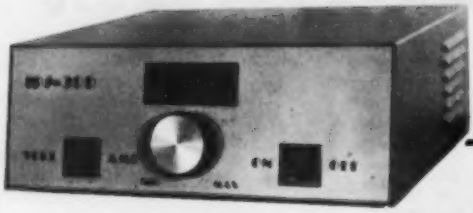

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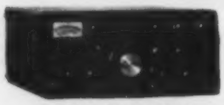

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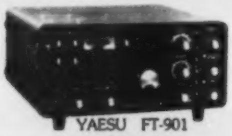

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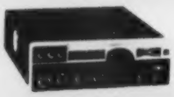

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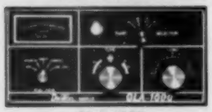

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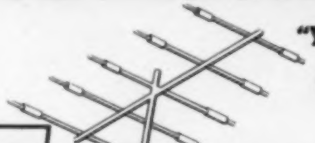

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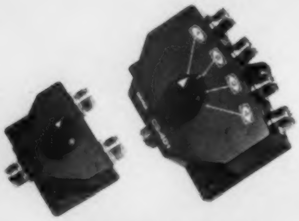

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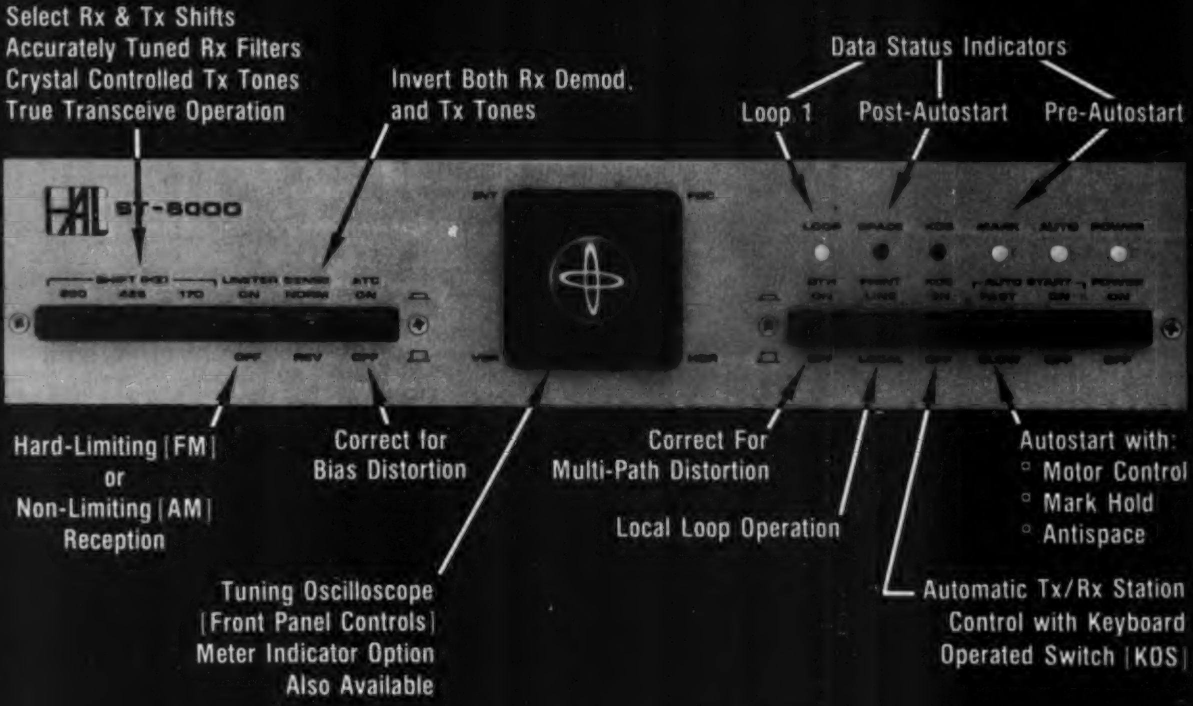
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| Gain, Typical: | |
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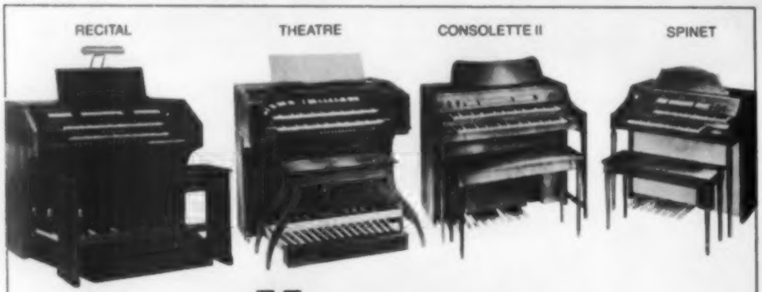

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| 103A | 1.11 | 175 | 1.62 | 225 | 4.34 | 294 | 1.14 |
| 104 | 1.06 | 176 | 2.08 | 226 | 1.67 | 295 | 2.02 |
| 105 | 2.27 | 177 | .49 | 228 | 1.36 | 297 | 1.13 |
| 106 | .80 | 179 | 5.69 | 229 | 1.06 | 298 | 1.13 |
| 107 | .79 | 180 | 5.68 | 230 | 3.60 | 299 | 2.02 |
| 108 | .89 | 181 | 4.65 | 231 | 3.96 | 300 | 2.02 |
| 121 | 2.15 | 182 | 3.35 | 232 | .70 | 302 | 2.80 |
| 123 | .89 | 183 | 3.63 | 233 | .74 | 306 | 2.80 |
| 123A | .79 | 184 | 1.37 | 234 | .72 | 307 | 2.57 |
| 124 | 1.53 | 185 | 1.70 | 235 | 2.45 | 308 | 7.85 |
| 126 | 1.16 | 186A | 1.46 | 236 | 5.75 | 308K | 3.27 |
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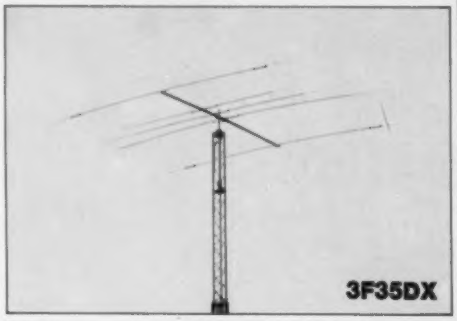
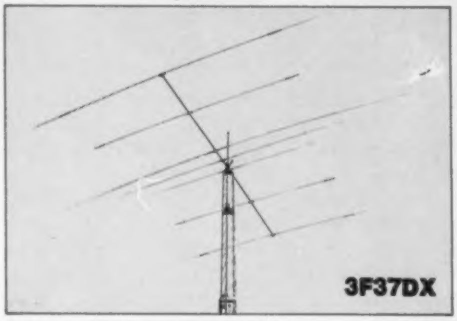
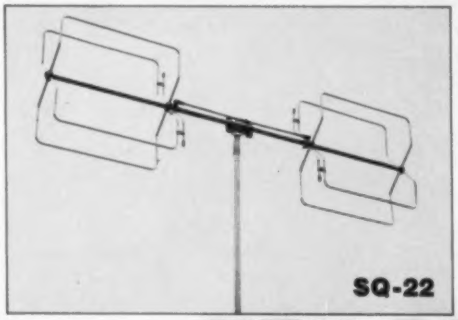

3F35DX


3F37DX

| MODEL | | 3F37DX | 3F35DX |
|---|---|---|---|
| BAND | | 14 21 28 | 14 21 28 |
| ELEMENTS | | 7 | 5 |
| ELEMENTS PER BAND | 20m | 3 | 3 |
| | 15m | 5 | 3 |
| | 10m | 5 | 3 |
| ANTENNA GAIN | 20m | 8.5dB | 8.0dB |
| | 15m | 10dB | 8.5dB |
| | 10m | 10dB | 8.0dB |
| FRONT BACK RATIO | | 25dB | 20-25dB |
| MAX. POWER INPUT | | 3kw | 3kw |
| VSWR | | 1.5 (or better) | 1.5 (or better) |
| IMPEDANCE | | 50 Ω | 50 Ω |
| MAX. ELEMENT L. | | 10.5m | 10.5m |
| BOOM LENGTH | | 7.5m | 5.0m |
| BOOM DIAMETER | | 50mm | 50mm |
| TURNING RADIUS | | 5.3m | 5.25m |
| WIND RATING | | 40m/sec. | 40m/sec. |
| SUITABLE MAST | | 50mm | 50mm |
| WEIGHT | | 23kg | 17kg |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# The DXer's Secret Weapon

## —costs you nothing

**Chart your way to DXCC.**

Having recently (finally) received QSLs from all fifty states and applied for my WAS award, I began thinking of other goals to pursue. DX came to mind.

I have been a ham since 1956, but, until a few months ago, I had never given much thought to working DX. From 1956 through about mid-year last year, my total DX was probably less than a dozen contacts (including XEs and VEs)—not an impressive record for some twenty years of casual hamming. Which brings us to my first observation about DXing:

*Casual hamming does not produce DX contacts!*

"So," I said to myself, "you gotta get serious if you are going to work DX."

Let's see—probably should get a linear so I can run a kW with the big guns. Gonna need a beam to replace my forty/fifteen meter vertical and that means a tower with a good base and heavy-duty guy wires. Oh yeah, some coax, some connectors, etc., etc., etc. Good grief! Getting serious about DX is going to run me into serious financial problems! There has to be another way!

After some head-scratching and a little reading in back issues of ham magazines (mostly *73*), I came up with a secret weapon for DX. With this secret weapon, my DX contacts went from a dozen or so in twenty years of hamming to seventy-four in a period of less than six months (*not* counting XEs and VEs)! If I had been making DX contacts at that rate during my previous twenty years on the air, I would have (can you believe it?) 3,040 DX QSOs to my credit by now. DXCC, here I come!

"What's the secret?" you ask. "How can I get one?!" you continue. Well, you are in luck. I am going to share my "secret weapon" with you for exactly what it cost me—nothing.

That's right, my weapon (shown in Fig. 1) cost not one red cent.

"You gotta be kidding," I can hear you saying, "that's nothing but a chart showing times in various

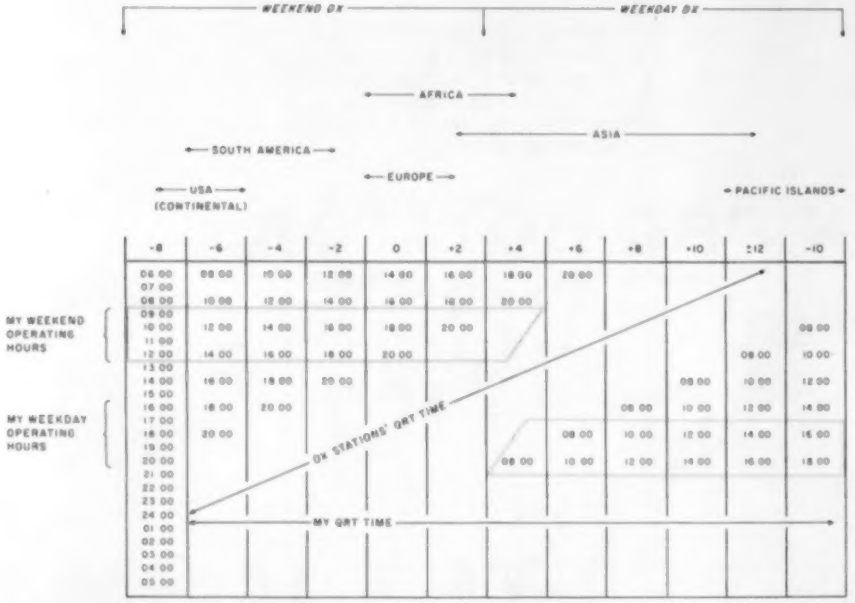

*Fig. 1. Shaded areas show DX windows for my usual operating times. See text for details.*

places around the world." You got it right!

I am sure that my secret weapon is no secret at all to those guys who have DXCC certificates hanging on their walls, but, for those of us who are DX novices, it can be a real discovery.

"Okay, how does a time chart help with DX?" you ask (if you are one of those who do not already know).

"Glad you asked that," I answer.

While trying to think of low-cost ways to improve my DX abilities, I reasoned that one requirement for working DX is that there have to be some DX stations on the air for me to contact. "Elementary, and obvious to the most casual observer," you say.

"Yes," I reply, "but they must be on the air when band conditions allow contact between their part of the world and my part of the world."

"So," you say, "when are DX stations likely to be on the air at the same time that the bands are open?" Your question can be answered easily, but first we have to make a couple of assumptions.

*First assumption*: Hams everywhere in the world probably have to hold some sort of jobs in order to buy the groceries and pay the electricity bill. Furthermore, they probably work about the same hours that you and I work: 0800 to 1700 local time, Monday through Friday. This being the case, they probably get on the air during the evenings and on weekends. (There are some DX hams who get on the air before going to work in the morning, and I salute those hardy souls and thank them for being there.)

*Second assumption*: The bands I work most—forty and fifteen meters—will probably be open from about 0800 to 2000 local time. I know that there are times when they stay alive all night, but these times have been rare in my experience, so I can't depend on that for DX. Besides that, I like a good solid eight hours of sleep every night.

Armed with these two assumptions (which have proven to be good enough to dramatically improve my DXing), I constructed a chart that shows my "DX windows" to various parts of the world. Here are some examples of how I have used the chart.

Let's suppose that I want to work England. Let's suppose, further, that my time zone is Pacific Standard, U.S.A. (which it is). Looking at the chart, we see that England falls on GMT (by definition). Based on my first assumption, the English chaps are going to be on the air from about 1700 to 2000 during the week. This period of time falls between 0900 and 1200 PST—right in the middle of my work day! This means that I must work Englishmen on weekends, which is exactly what I have done several times recently around 1800 GMT.

Here is another example. It has been very difficult for me to work Africa. Looking at the chart, it is easy to see why. Notice that there is only a two-hour window (1900—2000) during my usual weekend operating hours and no window at all during my weekday operating hours. It is obvious that I must get on the air earlier on weekends or stay on the air later during the week if I am going to improve my chances for working Africans. This illustrates how the chart can be useful in pinpointing DX problem areas.

Let's take a look at one more example. Suppose I want to work some DX on Wednesday starting at about 1800 PST. What DX will be available? The chart shows that Asia and the Pacific Islands will probably be in my DX window. This includes Australia, Japan, New Zealand, and Russia. I have found that the Russians get up early to get on the air, and the Japanese are on the air all the time (maybe hams don't have to work for a living in Japan!?). So, the chart says that I can work VKs, ZLs, JAs, and UAs after dinner during the week, which is exactly what I do.

I am sure you get the picture by now. DX is there to be had, and the secret is simple:

*Be on the air when DX stations are on the air!*

"Yes, but what kind of equipment does it take?" you ask.

Well, my experience has been that the average DX ham is equipped with a rig similar to mine: about 150 Watts input with a vertical antenna. Actually, most of the DX hams I work have better rigs than mine in that they usually have a beam of some kind. Which brings us to another observation:

*For working DX, the next best thing to a time chart is a better antenna.*

That is where my next investment is going. I figure that a better skyhook is the absolute best dollar investment I can make.

I don't know any big gun DXers personally, so I have not discussed my ideas about DXing with anybody who really knows how it's done. I do know that my DX count has gone up as a result of putting the chart together and using it. If you are a beginner at the DX game, it surely won't hinder you any. So why not put together a chart for your own time zone and give it a try?! ■

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# Foiling the Mad Kerchunker

## —frustrate him with this circuit

**How to give ulcers instead of get them.**

*Bill Wageman K5MAT/N5EE*
*35 San Juan*
*Los Alamos NM 87544*

Repeater operators! Arise! Fight back! Show the cads you're in charge! Stop getting ulcers because some refugee from the world of little children is playing with his toy and kerchunking the repeater!

How do you feel about kerchunkers? Does the very first one get you down? Or does it take a few to wear on your nerves? Or can you stand it for hours on end? If you're in one of the first two groups, read on, but if you're in the latter group, take a ride on the Reading, and if you pass GO, collect $200—you deserve it for your patience. This article holds little for you except education about how grouchy much of the rest of the world is about kerchunking.

So what's a kerchunk? Almost everybody who has operated on repeaters for any length of time has a pretty good idea, but there are some who may not yet have been exposed to the VHF-FM equivalent of tuning up the HF-band rig on the air without any identification. It's a poor operating practice designed mostly to allow the kerchunker to see if the repeater is still alive. A more-or-less quantitative definition (one that is necessary for this exposition) of a kerchunk might be stated: "A kerchunk is an unidentified key-up (or transmission) of short duration on a repeater input frequency." Most kerchunks are well under one second duration.

With a decent definition of a kerchunk, we may now think about how to design a kerchunk detector on the repeater. Once you have the ability to detect these strange creatures, it's feasible to try to do something about them. What a guy cares to do depends heavily on the situation, but let's look at a few of the possibilities.

You can ignore them altogether if you can stand it. There is a minor question about the legality of continually repeating unidentified transmissions, but that's not the point. You can listen to the kerchunking for a short time and then shut off the repeater

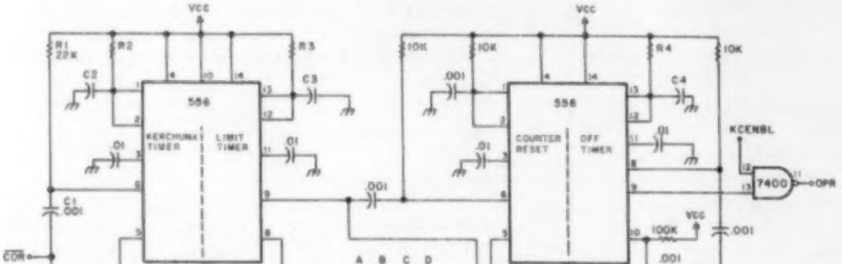

*Fig. 1. Schematic diagram.*

for awhile. This denies repeater access to everyone, of course, but could result in a certain amount of "peer pressure" on the guilty culprit(s). You could also, on the first kerchunk, measure the incoming frequency (assuming there's a discriminator on the repeater), and then lock out only those incoming signals near that frequency. This solution is still not ideal, but it is already quite difficult to implement unless you have a microprocessor-controlled repeater, so I have chosen the middle course.

Let's suppose, for purposes of discussion, that the control logic in your repeater is TTL-compatible. If not, you will have to use whatever level shifters that are necessary to make this true. Please note in the discussion that I have assumed certain stated active signal levels—yours may have to be inverted.

So, somewhere you have a squelch-operated control signal. I'm assuming that when the squelch is closed you have a TTL high, and when it opens you have a TTL low. Let me call this signal $\overline{\text{SOS}}$, for NOT Squelch-Operated Signal. The overhead bar, or the word NOT, means the active signal is a low. If we capacitively-couple $\overline{\text{SOS}}$ to the input of a 555 timer (or ½ of a 556), that timer will be triggered whenever the squelch opens, and its output will go high. If we NAND the output of the timer with the $\overline{\text{SOS}}$ itself, it's evident that if the squelch closes *before* the timer goes low, we'll get a TTL low out of the NAND gate. Thus we have a kerchunk detector—if the key-up is shorter than the timer period, it's a kerchunk.

I have chosen to do two things with this signal. It increments a counter and starts another timer, which I'll call the limit timer. When the limit timer's period is up, it triggers a third timer which then issues a short reset pulse to the counter. We clearly don't want to shut off the repeater because it was kerchunked once on each of four consecutive days!

However, the output of the limit timer is also NANDed with any one of the four outputs from a 7490 decade counter. If the one output is chosen, only one kerchunk is needed to cause the output of the NAND to go low. If the two, four, or eight output is chosen, then it will take two, four, or eight kerchunks *during the limit timer's period* to cause the output of the NAND gate to go low.

This signal is capacitively-coupled to still another timer, the off timer. This timer gets set when the NAND goes low, and its output stays high during its period, which may be anything you like. I have NANDed this timer's output with a TTL control signal I've called KCENBL (*K*erchunk *C*ircuit *ENaBLe*). This is a signal that must be provided by your control circuitry to enable (high) or disable (low) the anti-kerchunk circuit. If you don't want to mess with this sort of thing, just tie that pin to Vcc through a 1k resistor so that the circuit is always on.

The output of this gate might be called OPR, for *OPeR*ate. When this output is high, the repeater is allowed to go on and off freely with the squelch, and when the output is low, the repeater is disabled. If you need the opposite polarity to disable your repeater transmitter, it's easy enough to run this signal through an inverter. Note that the fourth NAND gate in the 7400 can be used as an inverter for either the input or the output signal, if necessary.

There is a desirable fourth connection to your repeater-control logic, called $\overline{\text{RESET}}$ (NOT RESET). A TTL low on this line will reset the off timer to zero, independent of how long it has been on (the repeater has been off). This allows a control operator to immediately defeat the anti-kerchunk circuit without disabling it.

Some of you are undoubtedly griping that I did not consider part of my definition of a kerchunk when I designed this circuit. I said a kerchunk is an unidentified key-up. So, in reality, one should check to see whether or not audio is present on the signal before assuming it's a kerchunk. I chose to ignore this aspect because I felt it was not all that important, it would be easy to defeat with a Bronx cheer, and the timing of the kerchunk detector I used is so short that it is unnecessary. If you have read this far you probably have the knowledge to add audio detection if you want. That first gate could be made into a three-input NAND gate and appropriate audio detection circuitry added.

The component values given in Fig. 1 are recommended as a first try and should be satisfactory if you are actually using TTL logic. R1 and C1 may have to be increased to give more reliable triggering if $\overline{\text{COR}}$ is not a good square wave. R2 and C2 form the time constant for the kerchunk detector, which may be anything you like within reason. Choose the Rs and Cs for the timers by the formula $t = 1.1\,R\,C$, where t is the desired time in seconds, R is the resistance in Ohms, and C is the capacitance in farads. My version defined a kerchunk as a key-up of less than about 200 ms, so any audio present is essentially irrelevant.

R3 and C3 define the limit timer period. I chose a value of around 30 seconds, but almost any reasonable period that strikes your fancy is OK. The reset timer period is 10 microseconds and should be adequate for any TTL counter.

How long do you leave the repeater off? R4 and C4 determine this length of time, and I chose five minutes as a reasonable off period.

It is desirable to use good engineering practices when building any logic circuit, particularly when it will be used in what might be called a hostile environment. Be sure to do proper bypassing and shielding, or glitches will be your companion-control operator! Mechanical relays somewhere ahead of the circuit could easily have contact bounce problems that would make *any* transmission appear to be a series of fast kerchunks.

There are two problems I see associated with the use of this sort of thing. It is not desirable to deny everyone the use of the repeater just because someone is discourteous to his fellow amateurs. Some of the worst offenders are likely to get their kicks by using this device to shut off the repeater so others can't use it! It is also undesirable to have a repeater "kerchunked" off by a fluttering mobile signal. Neither of these problems is easily solved unless a microprocessor logic element is available—but that's another story.

I would like to thank Bob Cowan K5QIN, trustee of the Los Alamos Amateur Radio Club repeater (WR5ABU), who kindly permitted a shakedown cruise of this circuit, and the club members and repeater users who put up with the whims of a guy who wanted to see if anything short of murder could effectively discourage kerchunking. Remember CRANK: Courteous Radio Amateurs Never Kerchunk. ■

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*18 Indian Spring Trail*
*Denville NJ 07834*

# Trends in Surplus

## —it's not what it used to be

**Don't give up hope.**

Radio amateurs reaped one of the first big benefits from surplus electronics. This bonus first appeared after WWII, when there was lots of surplus military equipment on the market, and lasted well into the fifties. Many of the rigs sold only needed simple modification to get them on the ham bands. There were plenty of small parts available for the builder, too.

To a large extent, this has changed. There is less of the wartime surplus available, and the prices are not all that great. Also, it is many years old now and behind the field in several cases. We were spoiled by its simplicity. There is no equivalent now. There just is not that much modern surplus military equipment for the ham. And the prices are higher for what there is.

The situation looks bleak. Actually, it looks bleaker than it really is. There is plenty of surplus available, but the field has changed. While there may not be the dream rig just waiting to be picked up for a song, there are entire categories of worthwhile surplus that can be of great benefit to the amateur.

It should also be pointed out that the amateur is no longer the main user of surplus. There are schools and industries, as well as electronics hobbyists, using surplus now. It may help someone who would like to start taking advantage of this to outline the main categories of what is available and where it might fit into his plans.

Many still think of surplus as being synonymous with military surplus. There is still military surplus available, and newer equipment being released, too, but probably the biggest category of surplus is industrial surplus.

Let's start with the military. There are still the older tube rigs available from the war and the fifties. It is mostly the receivers that are eagerly sought, some of them perhaps more eagerly than they warrant. You can pick up a rugged, solidly-built receiver that will do workhorse service for you. You can also buy some that are extremely hard to service. For example, the R-390 series is highly regarded but difficult to maintain. Parts are a real problem.

There are also a number of tube-type components still available. This goes for high-power projects and so forth. You may have problems finding a reliable source for inexpensive small parts for a tube project, though. There is some newer solid-state military surplus coming through, but at a higher price than what makes surplus buying attractive.

The next biggest category of military surplus would be test gear. You can pick up some military versions of civilian gear at a low price. However, this may not be what you need. Much of this is lab-grade gear, which sounds nice, but if it needs any sort of servicing to be put back in order, you may have problems. You could wind up with something that you can't even use. Here you have to weigh your troubleshooting experience and your test bench.

It is schools and smaller industries that benefit the most from this if they can check out the gear themselves. They may wind up with additional equipment at reasonable cost with the addition of just their own time and expertise.

In the same way, there is industrial surplus of ready-built test gear, too. Unless it has been gone over for you by the seller, you have the same problems as with military surplus. If it doesn't work right, can you fix it yourself?

There are a few hidden pitfalls with much of this gear. A lot of the postwar gear uses the early printed circuit boards. A lot of it received continuous-duty service. That and age have done things to those PC boards.

When you go to work on them, you may find that the board itself has deteriorated to the point where it causes intermittent problems (the foil may be starting to peel), and that adds up to a service headache.

A lot of equipment is of hybrid design—mixed tubes and transistors. Since it is precision gear, the tolerance is important. By this time it is long out of tolerance. The cost to start at the beginning and bring all the sections up to tolerance may be so out of sight as to be impossible. If the cost doesn't get you, the lack of available replacement parts will.

The use of mixed tubes and transistors, particularly circuits that mix both together, represents a careful blend of the worst features of both tubes and transistors. That means you will be trying to make an out-of-tolerance circuit function well. Hybrid circuits are more difficult to service at best. Often these circuits were riding right on the edge of a usable state-of-the-art technology. They were apt to have very little tolerance for variation even when new. Trying to get them to function as out-of-tolerance circuits may not be practical.

The used, unchecked price may look very attractive, but can you fix it? The checked or good condition (working) price may not be that good when compared with a new, or kit, price for gear that may be simpler, but will do the actual job you need. A rule of thumb would be that you should have at least equal or better grade gear and expertise than you are trying to service.

That's the part that looks so bleak. Where is the nice, easy, and cheap part? Well, it's all in how you look at it. There are areas which are electronic heaven for those who can use it. These are in the field of industrial surplus. First of all, how do you feel about solid state? This is where the action is. In fact, the values here are often even better than the values that are fondly remembered from the late forties and fifties.

Solid state is mostly low voltage. It also becomes obsolete almost instantly. Manufacturers dump it by the ton. Just two examples: A 1967 catalog listed the SN7400 for $6.50 each and the SN7490 for $23.20. Now you can get the SN7400 for about 16¢ and the SN7490 for about 45¢. That's a few cents on a dollar. And those 1967 prices had come down quite a bit from the original prices. In that field, individual solid-state devices of all sorts have been priced lower, and the small parts to go with them are available at comparable prices. This takes care of transistors and digital ICs, but there is more. Even though they are newer, consumer-oriented ICs are also on the surplus market. You can not only buy some of the older consumer ICs, but also some that are still in use commercially. This gives you whole sections of equipment.

You are familiar with the audio amps and preamps. There are also rf sections and specialized ICs available, and are they ever cheap.

For what is available, you can often build a transistor or IC circuit for much less than an experimental tube circuit of the same type. Power supplies are always a high-cost item with tube work. With transistors and ICs, there is so much available in parts and built supplies that the cost is not a major factor. There are lots of rf transistors and power types available for the experimenter, so in that area you can work with some reliability.

While tube parts are hard to come by, this is really only in one area. Old-style tube thinking is expensive, but there is one way that you are ahead of the game. Take advantage of the state-of-the-art in tubes. What? You didn't know tubes had changed? Then you haven't had to work with TV sets much lately.

There is a lot of tube technology designed for use in TV sets. This hinges on a line-operated supply (mostly without a transformer) of about 100-200 volts. The TV tubes are built to work well in this range. There are lots of modern compactron multisection tubes that hams and experimenters have yet to touch. And the benefits from them are great. There are plenty of low voltage parts for receiver and TV replacement use around, even in surplus. There are also many power supply transformers and parts available, too. This puts a tube circuit cost on a par with transistor work. The initial capital cost for bench supply and some parts will be slightly higher, but once you have them, you have them, and the difference is only a few dollars.

So you still have the option of going tube or transistor at a reasonable experimenter's price. Keeping to receiver voltage levels is the key. Once you go above that voltage range, the price goes up fast.

There is still more. There are a few areas of specialized surplus to explore. The computer field did not just dump a few measly ICs on us. There is also ready-built computer equipment. To name a few items, there are power supplies, keyboards, video terminal units, and whole sections of standard business equipment oriented towards computer interface. If you know what it is and what to do to get it going, there are bargains for the knowledgeable.

There are some other areas of commercial surplus, too. These are more consumer-oriented. Many brands are really the same or similar equipment bought from other manufacturers. There are lots of hi-fi-type components and semi-complete equipment that can be utilized with little work. These prices are often quite low.

In short, there is another renaissance of surplus upon us, but the times and technologies have changed. With some work to update and upgrade your basic electronic knowledge, much is adaptable to ham or other experimental uses. There are a few gaps that make it a bit rough on some types of building. These make it seem as though there is not much available for building. Hams in particular are bothered by this, as certain key items are just not right at hand at surplus prices. A big headache is tuned circuits. It is hard to get the coil stock which used to be a part of every project. The slug-tuned coils are hard to find, too. There are sources, but the price is at a premium. There are ways around this; however, there is another problem.

The other half of the tuned circuit is a variable capacitor. The usual small variable with a shaft for a knob is not that common or available these days. This makes all sorts of tuned circuits for receivers and transmitters hard to build, particularly when an author uses a specific part in an article. There are ways this might be eased. There are easily-available sources for toroid cores and information on using them in circuits. They are not that common in construction articles, though.

Tuning can also be done with varactor diodes in many circuits, but this is also not common in many articles. Other parts are also not common. The modern i-f strip parts, such as crystal or ceramic i-f filters, which are quite cheap for manufacturers, have not shown up on the surplus market. The standard receiver i-fs, in particular, are hard to come by. Even the older-style transistor i-f transformers are not common items. Many construction articles use very expensive and hard-to-come-by filters for construction. There are few simple alternatives given. Power stages are always a problem. When the voltage or power goes up, the price goes up and the item becomes hard to come by.

Some ham items have benefited from all of this technology. The frequency counter as a ham item is so new that it is still considered exotic, and yet in the few years since it hit the ham market, the price has dropped steadily. At first, they had to be home-built to get any price break, and they were fairly expensive then. Now you can buy kits and ready-built units for less than you can build your own.

A counter that would have cost industry thousands just a few years ago costs a ham a few hundred. A less-costly unit will still be more accurate than any frequency standard available to hams up to now.

However, we still have the problem that our basic purpose, communications equipment, is not so easily served by the surplus market. The nearest thing to it is the conversion of CB gear to ten meters. That may catch on in quantity, but in the meantime it's more symbolic than a major force.

This apparent lack in modern surplus should not really be such a major problem. What it means is that we have not yet solved some of the technical problems in utilizing what is available for our more common amateur uses.

This is what is called a culture lag. The material is there, but we have just not fully adapted it to our purposes.

It would seem likely that in the next few years there will be some breakthrough in the use of modern surplus that will bring a time of simple but effective home-brew ham gear. This will probably have an effect not unlike that of the coming of the available frequency counter. In particular, it will put equipment within reach of many who are not able to spend much to get started. There is very little simple rugged equipment at a beginner's price, particularly equipment that can compete in real performance with the store-bought.

That's the big problem. Even for the same money, there are few who could build a receiver that would actually work as well as a commercial kit or ready-made unit.

Better utilization of the available surplus now, and what may become available in the next few years, should produce projects where the cost, complexity, and availability vs. performance ratio should be favorable enough so that it will be a tangible inducement for many more hams to build some of their gear again. ■

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# An 8080 Repeater Control System

## —part IV: addenda

Several additions have been made to the control system. The LM309K regulator IC in the +5-volt power supply has been replaced with an LM323K-5, which has a higher current rating. An "old code" command has been added to the program, the Mohawk Message Repeater has been swapped for a standard 8-track player, and a telephone switchover network has been added to share a single telephone line with two repeaters.

**2#1 Message**

You are hearing an amateur radio repeater. Very simply, a repeater consists of some electronics equipment which boosts radio communications range. A repeater has a receiver and a transmitter operating on different frequencies. They utilize antennas located as high up as possible. Because of the high location and very good quality equipment, repeaters can receive transmissions from much further away than can be normally done and can be heard at a further distance than is commonplace. The repeater retransmits weak signals, permitting walkie-talkies and mobile stations to communicate with each other up to a hundred miles apart or more, when without a repeater, the range may be only several miles or several tens of miles.

Repeater operation is but a small part of what is available to the radio amateur, or ham, as he is commonly called. Hams routinely talk to other hams around the world on the shortwave bands. Some operate the international Morse code and others use single sideband, a modern form of voice communication. Many hams operate radioteletype, and some even transmit pictures across continents. There are some amateurs with fast-scan television stations of their own.

Ham radio is a fascinating hobby. Some hams like to build equipment and some just like to talk, but most do a little of both. Hams keep up with the ever-growing technology of today. Amateurs built several satellites, had them placed into orbit, and can now easily communicate through their very own satellites, called OSCAR (for orbital satellite carrying amateur radio). Some hams even have homemade computers completely running their stations!

Amateurs have a lot of freedom to operate on the air and build their own equipment. This is because each and every ham must demonstrate to the Federal Communications Commission before receiving a license that he has an understanding of both radio law and electronics theory in addition to knowing the international Morse code.

Ham radio is both a fun and an educational hobby. If you think that you could develop an interest in ham radio, contact the Baltimore Amateur Radio Club at PO Box 5344, Baltimore MD 21209. Or dial H-A-M-T-A-L-K, HAMTALK, on your telephone for further information.

This has been the two-pound-one message. Two-pound-two gives general information, two-pound-three supplies current club information, and two-pound-four explains more about the repeaters.

### The Old Code Command

The Baltimore Amateur Radio Club changes its autopatch access code annually. I added the old code command to make it clear to users that their touchtones™ were accepted, but that the old access code was used and no longer activates the autopatch. When the old code is used, after the carrier drop, the control system sends "OLD CODE" in CW.

The programming is simple, and Listing 1 shows this routine. The routine calls WCD, loads the HL registers with the message address, and CW is called. In the code table, the old access code now points to OLDCD.

### The Tape Loop

The tape machine described in Part I developed a problem, and the opportunity was taken to replace it with a common 8-track tape player. This is most suitable because a loop configuration is required. The primary drawback to the Mohawk Message Repeater was that the recorded message had to be exactly as long as the tape itself. The new system is

```
OLDCD:  CALL    WCD
        LXI     H,OLDMS
        CALL    CW
        JMP     TTON2
;
;
;
OLDMS:  DB      80H     ;SP
        DB      0F0H    ;O
        DB      48H     ;L
        DB      90H     ;D
        DB      80H     ;SP
        DB      0A8H    ;C
        DB      0F0H    ;O
        DB      90H     ;D
        DB      40H     ;E
        DB      80H     ;SP
        DB      0
;
;
;
CODTB:  DB      9
        DB      8
        DB      12      ;#
        DW      OLDCD
```

*Listing 1. The "old code" command.*

**2#2 Message**

Welcome to the Baltimore Amateur Radio Club's 07/67 repeater, WR3AFM. The transmitter is located at the old WBAL tower on Park Heights Ave. The repeater has receivers north of the beltway on Old Harford Road, at the WRBS tower near I95 south and the beltway, downtown at 4000 North Charles Street, at the QTH of K3VC and N3JC at the top of the Jones Falls expressway, and a fifth receiver in Randallstown. A voting selector feeds the best signal to the transmitter.

At the transmit site, there is also a duplexed 440-MHz repeater, 444.35 in and 449.35 out.

You will note that a short click is heard after releasing your carrier. This signifies that the repeater timer has been reset and leaves time for breakers. It is not necessary to let the repeater carrier drop. 07/67 has an autopatch limited to travelers and club members, though open to anyone for emergency traffic.

The repeater is set up to block touchtone signals from repeating. There are several codes that anyone is welcome to use after proper identification. One-pound-one links the 67 machine with the 440 repeater. To acknowledge that function, the repeater sends an "R" in Morse. The repeaters remain linked until a star is sent, again acknowledged with an "R". Two-pound-one plays a tape giving a brief introduction to ham radio. Two-pound-two gives this recorded message. Two-pound-three supplies current club information. Two-pound-four gives more information about our repeaters. Tape messages can be activated at most once every ten minutes. Three-pound-three will disable the repeater's blocking function until the carrier is dropped, permitting the tones to be repeated. Any touchtone digits sent after four-pound-four will be verified in Morse after the carrier drop. Five-pound-five will repeat what was sent during a four-pound-four operation, or the telephone number dialed during an autopatch, whichever was last.

The control system for the repeaters is an 8080-based microprocessor which performs the various functions, including multiple identifications as well as redialing telephone numbers for the autopatch.

The Baltimore Amateur Radio Club has another two meter repeater, 34/94, which is a split-site repeater in the Northern Baltimore area. We hope you enjoy the use of our repeaters, and we would like to see you at our meetings the first and third Wednesdays of the month at the Ames Methodist Church in Pikesville at 8 pm. Listen for interesting bulletins weekdays on 67 at 7:30 am and rebroadcast on 94 at 6 pm. Code practice can be heard Mondays at 9 pm on 34/94. Should you desire to contact the club, write the Baltimore Amateur Radio Club, PO Box 5344, Baltimore MD 21209.

**2#3 Message**

This is the two-pound-three message. Two-pound-one gives an introduction to amateur radio, two-pound-two supplies a generalized message, and two-pound-four provides information about the repeater equipment.

This repeater is sponsored by the Baltimore Amateur Radio Club, PO Box 5344, Baltimore MD 21209.

Where is the current DXpedition? What is the WWV propagation forecast for the upcoming week? When is the next local hamfest? To find the answers to these and other questions, listen to the BARC bulletins weekdays at 7:30 am on 07/67 and at 6:00 pm on 34/94. Keep up with your hobby.

(In CW at 35 wpm: Hams constantly strive for proficiency with CW.) Code practice sessions are held on Monday evenings at 9:00 on 34/94. Call in your requests next Monday night and test or improve your code speed.

Remember to dial H-A-M-T-A-L-K, HAMTALK, in the Baltimore area for current information. Spread the number around to your non-ham friends.

Don't forget to write an article or two for the club magazine, the *Modulator*. If you can help out with amateur radio classes, contact W3HYY.

Is there something that you can do or suggest for the club? Come to some meetings and volunteer—we'd love to have your participation.

BARC meetings are held at the Ames Methodist Church in Pikesville at 8 pm. Business meetings are held the first Wednesday of the month. General meetings include a presentation and are held on the third Wednesday of the month. Everyone is welcome at both meetings.

The September meeting will be a discussion of spark-gap transmission and ham radio of years past. The October meeting will be a tour of the Emergency Medical Radio Service at Sinai Hospital. November's meeting boasts a talk on radio-controlled models. The January meeting will be the annual BARC auction, the February meeting will have demonstrations of antennas and their patterns, and the March meeting will be all about our repeaters. Try to join us at these meetings, if possible.

more versatile and allows the message to be any length up to the length of the loop itself. Since the tape player is stereo, it is convenient to place the message audio on the right channel and a tone on the left channel to indicate when the message is finished. Standard 40-minute tapes supply 10 minutes per track. The control circuitry activates the drive mechanism upon request, and when the message is done and the tone is encountered, the tape system disconnects itself from the repeater and continues running until the metallized strip signifying the beginning of the tape is reached, shutting off the machine. A bonus is that the tapes can only be activated once every ten minutes. A KILL command has been added to allow termination of the tape message when desired.

The tape player has four pairs of tracks, so this feature was exploited to provide four different tape messages. The original single 2#2 tape request is expanded to four, accessible via the codes 2#1, 2#2, 2#3, and 2#4. The microprocessor remembers which track the tape player is on and advances the head assembly to the requested tape track. The 2#1 message is for non-hams. It briefly explains what amateur radio is all about and is useful when someone asks what your handie-talkie is for. 2#2 is a shortened version of what it was before. 2#3 supplies current club information: net schedules, meeting programs, etc. The relative availability of 8-track recorders permits monthly updates to be made. The 2#4 message is a more detailed description of the repeaters.

Fig. 1 shows the tape loop interface. This circuitry is built into a minibox and mounted to the tape player. The only connection between the tape player and the control system is the 16-pin DIP plug as before. The tape player is a standard 8-track designed for automotive use and operates from a 12-volt power source. Ac-operated players could be used with the addition of a relay to connect the unit to the ac line from a 12-volt coil. The circuit is quite simple. Relays K1 and K2 provide the switching logic. Normally, both relays are de-energized. When the start pulse from the processor grounds the floating half of the K1 coil, the relay pulls in. The SENSE contacts on the

```
;INITIALIZATION PROCEDURE
;
;
BEGIN:  XRA     A
        STA     LCKR
        INR     A
        STA     TRACK   ;TRACK #
RESET:  LXI     H,TIME-1
;
;
;
        ORG     2000H   ;THIRD ROM
TAPE1:  MVI     B,0     ;TAPEX PLAYS
TAPE:   LDA     OUTOM   ;THE TAPE ON
        ANI     2       ;TRACK X
        JNZ     TTON2
TAPC:   LDA     OUTOM
        ORA     A
        JM      TTON2
        CALL    SEEK
        CALL    WCD
        LXI     D,OUT3M
        MVI     B,80H
        CALL    BITS
        OUT     PORT3
        CALL    DELAY
        CALL    BITC    ;PULSE TAPE
        OUT     PORT3
        JMP     TTON2
;
;
;
TAPE2:  MVI     B,1
        JMP     TAPE
TAPE3:  MVI     B,2
        JMP     TAPE
TAPE4:  MVI     B,3
        JMP     TAPE
;
;
;
TAP1:   MVI     B,0     ;TAPX SAME AS
        JMP     TAPC    ;TAPEX BUT FROM
TAP2:   MVI     B,1     ;CONTROL CODE
        JMP     TAPC
TAP3:   MVI     B,2
        JMP     TAPC
TAP4:   MVI     B,3
        JMP     TAPC
;
;
;
SEEK:   LDA     TRACK   ;SEEK ADVANCES
        CPI     4       ;HEAD TO TRACK
        JC      SEEK2   ;SPECIFIED
        SUI     4       ;IN REG B
SEEK1:  STA     TRACK
        JMP     SEEK
SEEK2:  MVI     A,3
        CMP     B
        RC
        LDA     TRACK
        CMP     B
        RZ
        CALL    STEP
        INR     A
        JMP     SEEK1
;
;
;
STEP:   PUSH    PSW     ;STEP ADVANCES
        PUSH    B       ;HEAD ONE TRACK
        LXI     D,OUT4M
        MVI     B,40H
        CALL    BITS
        OUT     PORT4
        CALL    LDELY
        CALL    BITC
        OUT     PORT4
        CALL    LDELY
        POP     B
        POP     PSW
        RET
;
;
;
LDELY:  MVI     A,8     ;LONG DELAY
LDLY1:  CALL    DELAY
        DCR     A
        JNZ     LDLY1
        RET
;
;
;
```

*Listing 2. Tape commands.*

player are normally open, so the sensing transistor is normally low. This allows K1 to latch, supplying power to the tape player.

The PTT line is grounded only when K1 is activated and K2 is not. Likewise,

### 2#4 Message

WR3AFM consists of two separate repeaters: a 440-MHz repeater and a two meter repeater. The 444.35/449.35 repeater is a duplexed single-site repeater. The 07/67 repeater consists of five repeaters spread around town with the common input frequency of 146.07 MHz. These satellite receivers transmit via 440-MHz link frequencies to the 146.67 transmitter site. Each link has a Station Master antenna, a 146.07-MHz receiver, a 440-MHz transmitter, a control shelf, and a CW identifier. The IDer is required to satisfy FCC requirements, and for our purposes they continuously identify with a low-level, low-pitch tone. This can be used to determine which receiver has been selected.

At the transmit site, a voting selector chooses the best signal from the five links and sends it to the 146.67-MHz transmitter. The transmitter drives a 250-Watt amplifier, though only a portion of that power reaches the Station Master antenna through about 500 feet of feedline. All of this equipment is of the General Electric MASTR series.

The repeater control is performed by a dedicated 8080 microcomputer system. This consists of 57 integrated circuits and has 3K bytes of ROM, 256 bytes of RAM, seven eight-bit output ports, and three eight-bit input ports. The control program is over 1500 lines long. The 8080 accomplishes the user codes, the autopatch, and permits elaborate control options to be accessed via touchtones remotely.

The 34/94 repeater is also a split-site repeater. The transmitter is in Towson and directly feeds a Station Master antenna. The receiver is co-located with the 07 receive link at the Charles Street site. The 07 and 34 receivers share the same antenna. Therefore, the coverage of 07/67 necessarily engulfs that of 34/94. With the exception of the link transmitter, which is a Progress Line, the 34/94 equipment is all General Electric MASTR. It is necessary to wait for the beep to reset the three-minute time-out timer. Additionally, on 34/94, it is required to let the entire repeater carrier drop once every twelve minutes. This is because the drop delay is on the link transmitter, which causes it less wear and tear.

This has been tape message two-pound-four; two-pound-one gives an introduction to amateur radio, two-pound-two supplies a generalized message, and two-pound-three provides recent club information.

```
KILL:   LDA     OUTOM   ;KILL TAPE
        ORA     A
        JM      TTON2
        LXI     D,OUT4M
        MVI     B,80H
        CALL    BITS
        OUT     PORT4
        CALL    DELAY
        CALL    BITC
        OUT     PORT4
        JMP     TTON2
;
;
;
STEPR:  LDA     OUTOM   ;MANUALLY
        ORA     A       ;STEP HEAD
        JM      TTON2
        CALL    STEP
        CALL    ROGER
        JMP     TTON2
;
;
;
        ORG     3000H   ;RAM BOTTOM
;
TTDIG:  EQU     $
        DS      25      ;SPACE FOR DIGITS
NUMBR:  DS      12      ;TEL #1
IDAD5:  EQU     $
        DS      196     ;SPACE FOR STACK, ID #5
STACK:  EQU     $
OUTR1:  DS      1
OUTR2:  DS      1
OUTR3:  DS      1
TIMER:  DS      4
NOTIM:  DS      1
LCKR:   DS      1
IDS:    DS      1
IDN:    DS      1
TRACK:  DS      1
TIME:   DS      1
MASK:   DS      1
LKROG:  DS      1
OUTOM:  DS      1
OUT1M:  DS      1
OUT2M:  DS      1
OUT3M:  DS      1
```

```
OUT4M:  DS      1
OUT5M:  DS      1
OUT6M:  DS      1
OUT7M:  DS      1
;
;
;
CODTB:  DB      2
        DB      12      ;#
        DB      1
        DW      TAPE1
        DB      2
        DB      12      ;#
        DB      2
        DW      TAPE2
        DB      2
        DB      12      ;#
        DB      3
        DW      TAPE3
        DB      2
        DB      12      ;#
        DB      4
        DW      TAPE4
        DB      7
        DB      3
        DB      11      ;*
        DW      KILL
        DB      2
        DB      11      ;*
        DB      1
        DW      TAP1
        DB      2
        DB      11      ;*
        DB      2
        DW      TAP2
        DB      2
        DB      11      ;*
        DB      3
        DW      TAP3
        DB      2
        DB      11      ;*
        DB      4
        DW      TAP4
        DB      8
        DB      8
        DB      11      ;*
        DW      STEPR
```

audio is available only under the same conditions. At this point, the tape is running, the repeater is keyed up, and the tape audio is feeding the transmitter. The right and left audio channels have a 10-Ohm load resistor to protect the audio output stages. The left channel is stepped up in voltage, rectified, and fed to a tone-detect transistor. Most of the left channel is empty. At the end of the message, a tone of almost any frequency is placed on the left channel for five to thirty seconds. The tone-detect transistor detects the tone and activates K2. Immediately, the PTT and audio lines are released and the repeater is freed up. K2 latches through the grounding contact. Both relays remain latched, continuing to power the tape player, until the metal foil on the tape reaches the SENSE contacts. This unlatches K1, which releases K2, and all returns to the rest mode.

The track solenoid in the tape player usually requires several Amperes to drive it. Relay K3 drives the track solenoid and is driven by an open-collector output bit on the processor. This permits the processor to control the track-select mechanism. A ground on the KILL line simulates the beep tone, killing the tape message. A 12-volt power supply is included to power the unit. The tape player must be modified by breaking the leads on the SENSE contacts and the stepping solenoid and bringing them out separately.

A considerable amount of software is necessary to control the multiple-track tape system. The system works by dead reckoning; the processor maintains a memory of which track the machine was last on and advances the track until the desired one is reached. A better arrangement would utilize a tape machine which has individual lamps to indicate the track. These signals could be sent to input ports of the pro-

```
SWTCH:  LXI     D,OUT4M ;SWITCH TO
        MVI     B,2     ;450 RPT
        CALL    BITS    ;ON PHONE
        OUT     PORT4
        CALL    DELAY
        CALL    BITC
        OUT     PORT4
        JMP     TTON2
;
;
;
CODTB:  DB      5
        DB      9
        DB      11      ;*
        DW      SWTCH
```

*Listing 3. Switch command.*

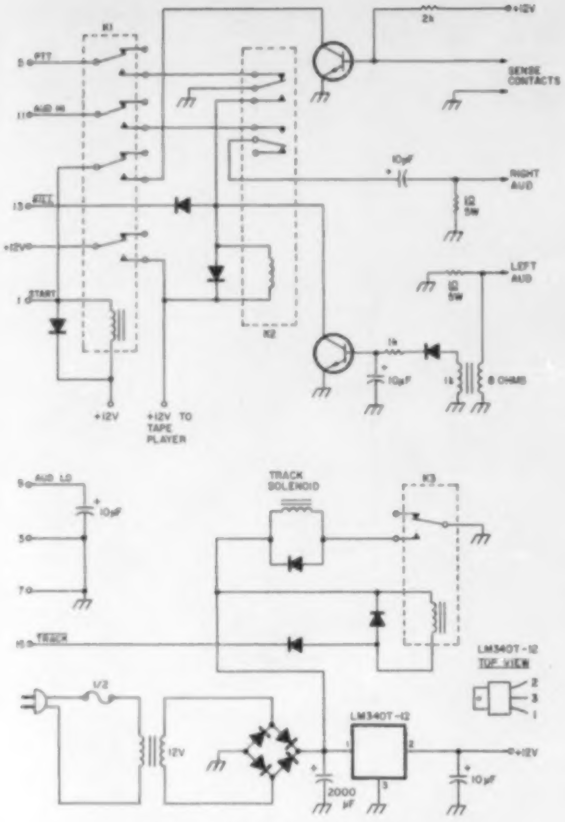
K1
PTT
AUD HI
KILL
+12V
START
2k
+12V
SENSE CONTACTS
10µF
RIGHT AUD
1Ω 5W
LEFT AUD
1Ω 5W
K2
1k
10µF
1k
8 OHMS
+12V
+12V TO TAPE PLAYER
AUD LO
TRACK SOLENOID
K3
TRACK
LM340T-12 TOP VIEW
1/2
12V
LM340T-12
2000 µF
10µF
+12V

*Fig. 1. Tape loop interface.*

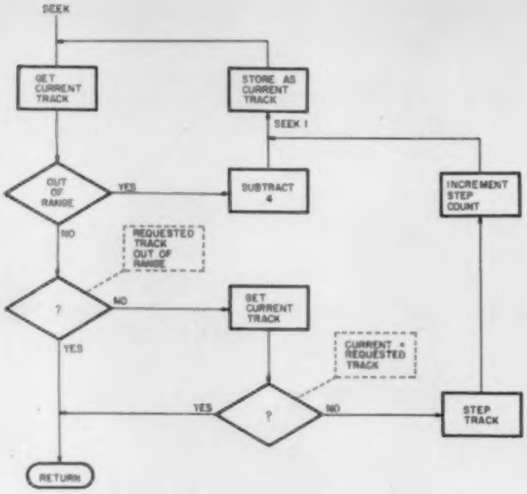
SEEK
GET CURRENT TRACK
STORE AS CURRENT TRACK
SEEK 1
OUT OF RANGE
YES
SUBTRACT 4
INCREMENT STEP COUNT
NO
REQUESTED TRACK OUT OF RANGE
?
NO
GET CURRENT TRACK
YES
CURRENT = REQUESTED TRACK
YES
?
NO
STEP TRACK
RETURN

*Fig. 3. The SEEK subroutine.*

cessor, and it could advance the assembly until the desired lamp was activated. I chose not to use this approach because the tape players with the added track lamps are not as readily available as the ones which do not have them. There has been little problem with incorrect track selection.

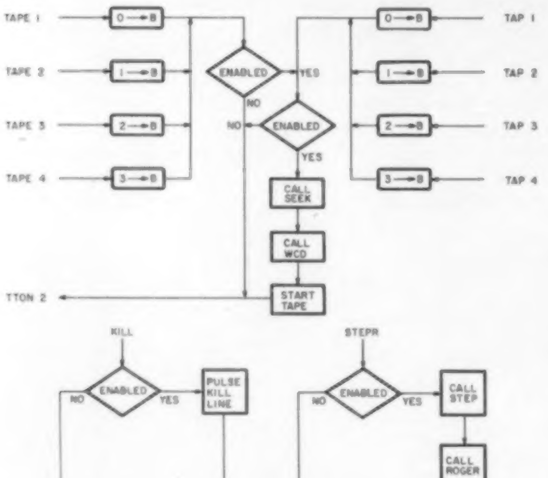
TAPE 1
TAPE 2
TAPE 3
TAPE 4
0→B
1→B
2→B
3→B
ENABLED
YES
NO
ENABLED
NO
YES
TAP 1
TAP 2
TAP 3
TAP 4
CALL SEEK
CALL WCD
START TAPE
TTON 2
KILL
ENABLED
NO
YES
PULSE KILL LINE
STEPR
ENABLED
NO
YES
CALL STEP
CALL ROGER
TTON 2
TTON 2

*Fig. 2. Tape commands.*

Listing 2 shows the tape-handling software. The four commands, TAPE1, TAPE2, TAPE3, and TAPE4, correspond to the 2#1, 2#2, 2#3, and 2#4 codes. Commands TAP1 through TAP4 correspond to the 2*1 through 2*4 codes for use by control operators. TRACK is the variable which specifies the current track. Upon initialization, TRACK is set to 1, corresponding to track 2. This is because 2#2 is the most commonly used message, and, after a power failure, presetting the program to that track gives the highest probability that the processor and the machine are in synchronization.

Fig. 2 shows the various tape commands. Register B specifies the desired track for the SEEK subroutine. The KILL command pulses the KILL line to the tape circuitry, stopping the message. The STEPR command steps the tape track and acknowledges with an "R". This is used to resynchronize the machine and the processor.

The SEEK subroutine is shown in Fig. 3. SEEK advances the head assembly until the desired track, passed in register B, is reached. Validity checks are made to prevent possible erroneous requests from pulsing the track line for long periods of time.

### The Switchover Board

Our 449.35 repeater has separate autopatch circuitry, and we had been using a second telephone line for it. To economize, we decided to utilize the main 146.67 autopatch line for the other repeater. The telephone switchover board decides which repeater is to have access to the telephone line. The phone line rests on the main control system, allowing control over the system via the telephone and permitting two meter autopatches. When an autopatch is requested on 444.35, if the line is not in use, the line is switched to that machine. The line remains there until the autopatch is terminated. The telephone line will only be given to a repeater if the other one is not using it at that time. If the request is not granted, a simulated busy tone is generated and sent to the second requesting repeater. To accomplish the remote base function on the 449.35 repeater, after dialing into the control system, the code 59* is sent. This switches the telephone line to the 449.35 repeater for 10 seconds. During this period, signals present on 444.35 will be heard on the telephone. If the autopatch code is sent before the ten seconds elapse, the autopatch will be activated, the remote base function is realized, and the line remains latched until killed.

The switchover board is shown in Fig. 4. The relay is normally relaxed and passes the phone line to the control system. Two 555s generate the busy signal. The 10k potentiometer sets the level of the busy tone to the repeaters. A single D-type flip-flop handles the switching logic. The flip-flop is CMOS and drives a Darlington transistor which drives the switchover relay. The numbered connections go to the phone connector on the main control system. If the processor grounds the GRAB line, the telephone line will remain on the control system no matter what. When the processor pulses the 450 REQUEST low, the ten-second timer is actuated, switching the phone line to 449.35. When an autopatch request is made on 444.35, +12 volts is present on the 450 AP line. The AP+RB+PHC line coming from the processor board signifies that the phone line is in use.

The software to implement the 59* command is shown in Listing 3. The 450 REQUEST line is pulsed low, and the command exits.

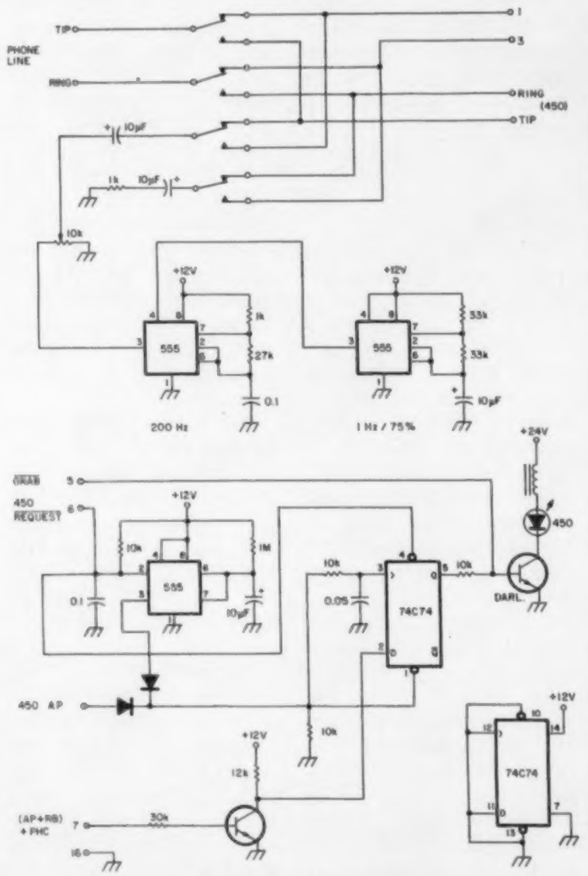

Fig. 4. Switchover board.

### Main Board Modifications

A small amount of wiring must be added to the main board to permit the new circuitry to operate. The new connector wiring is shown in Fig. 5. Two diodes are used to create the AP+RB+PHC signal required.

### Software

The software patches described may be included in full or in parts. It may be possible to fit the additions in the space remaining in the second ROM, depending upon how much space is taken up by the four different IDs and the single-digit telephone numbers. However, for us, it was necessary to expand to a third ROM. The last ROM is only about one-third utilized, so much more can be added before it becomes necessary to wire in a socket for a fourth ROM.

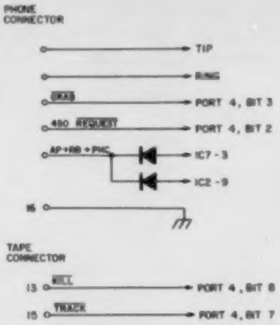

*Fig. 5. Modifications to processor board.*

### Acknowledgements

Thanks go to Ed Mester WA3HQX for his help in wiring the tape unit and for taking over the responsibility of preparing the tapes. Appreciation is also given for the golden voices of Matt de Rouville K3MR, Denise Oliver, Deborah Yost, Jim Harding K3DRJ, and Pat Biggs KB3CE, who have recorded tapes for us. ■

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| GONSET GSB-201 Power | $135 | EFJ T-BOLT Plate | $125 |
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| FILMT XFMR: | 7.5 VCT @ 21A 117 PRI-9.5LB | $ 30 |
| FILMT XFMR: | 7.5 VCT @ 55A 115/230 PRI-14.6LB | $ 65 |
| FILMT XFMR: | 7.5 VCT @ 75A 115/230 PRI-20.2LB | $ 95 |
| FIL CHOKE: | 30 AMP Bifilar Wound on ½"x7" rod | $ 9 |
| DC CHOKE: | 8.0 Henries @ 1.5 AMP DC 41LB | $150 |
| SWG CHOKE: | 5-30 Henries @ 1.0 AMP DC 23LB | $100 |

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# RTTY Transceive for the KIM-1

## —requires video terminal and AFSK generator

**No noise, no oil.**

Several good articles have appeared here in the pages of *73 Magazine* concerning the use of the KIM-1 microprocessor for RTTY work.[1,2,3] This article describes an easy-to-use program for RTTY transceive when teamed with WA5DXP's article.[1] It requires no additional memory for the KIM. It is also designed as a "standalone" program for RTTY transmission at all standard amateur RTTY speeds.

Basically, what we desired was a complete RTTY station without the need or bother of mechanical printers, TDs, or reperforators. The resultant system sends and receives RTTY at 60, 66, 75, and 100 wpm and has a built-in buffer for "auto-start" transmissions, auto-shift between Baudot letters and figures, and, finally, a built-in ID for the end of transmission. The program does not need to be manually stopped to switch between transmit and receive and back again. The resultant system is straightforward to use and totally silent.

Computer-generated RTTY station: Note use of inexpensive black and white portable TV, SWTPC CT-64 video terminal, and home brew interfacing box.

What will you need to make use of this program? Basically, you'll need a KIM-1 interfaced to a moderate-speed video terminal. We use 1200 baud, but find that the receive program has to be slightly modified to allow it to operate at this slow speed. Higher speed terminals will require no modifications to the receive program. Of course, to use this program for transmit, any terminal will work regardless of how slow. As long as you're interfaced through the standard KIM-1 TTY pins, the speed of input won't matter. The program will simply convert the input ASCII to Baudot and output it at any desired speed. We've found, though, that, on receive, the terminal doesn't have time to output the decoded character and get back in time for the next start bit. WA5DXP mentions running his terminal at 4800 baud; we simply don't have anything that fast! At 1200 baud, we've found that simply removing the last JSR DEHALF (change his line 0267 to EA EA EA) will allow his receive program to work on slower terminals. Comments would be welcomed if you have other ideas.

You'll also need an AFSK to convert the output of the transmit program to the proper tones. The program defines a mark as pin PB7 high, a space as PB7 low. This TTL level output can be used to drive an AFSK directly. We use a couple of sections of a 7404 hex inverter as a buffer. If you have a reason to interface directly to a standard 60 mA loop, you might consider the optoisolator approach used in an earlier article on this subject (see the references at the end of this article).

The transmit program

| Char. | Baudot | ZP Loc. |
|---|---|---|
| A | 62 | 41 |
| B | 4E | 42 |
| C | 3A | 43 |
| D | 4A | 44 |
| E | 42 | 45 |
| F | 5A | 46 |
| G | 2E | 47 |
| H | 16 | 48 |
| I | 32 | 49 |
| J | 6A | 4A |
| K | 7A | 4B |
| L | 26 | 4C |
| M | 1E | 4D |
| N | 1A | 4E |
| O | 0E | 4F |
| P | 36 | 50 |
| Q | 76 | 51 |
| R | 2A | 52 |
| S | 52 | 53 |
| T | 06 | 54 |
| U | 72 | 55 |
| V | 3E | 56 |
| W | 66 | 57 |
| X | 5E | 58 |
| Y | 56 | 59 |
| Z | 46 | 5A |
| 1 | 76 | 31 |
| 2 | 66 | 32 |
| 3 | 42 | 33 |
| 4 | 2A | 34 |
| 5 | 06 | 35 |
| 6 | 56 | 36 |
| 7 | 72 | 37 |
| 8 | 32 | 38 |
| 9 | 0E | 39 |
| 0 | 36 | 30 |
| ! | 5A | 21 |
| " | 46 | 22 |
| $ | 4A | 24 |
| & | 2E | 26 |
| ' | 1A | 27 |
| ( | 7A | 28 |
| ) | 26 | 29 |
| ; | 3E | 3B |
| : | 3A | 3A |
| , | 6A | 2C |
| . | 1E | 2E |
| / | 5E | 2F |
| ? | 4E | 3F |
| c/r | 0A | 0D |
| l/f | 22 | 0A |
| space | 12 | 20 |
| figs | 6E | 06 Note 1 |
| ltrs | 7E | 0C Note 1 |
| - | 62 | 2D |
| stop | 16 | 2B Note 2 |
| bell | 52 | 2A Note 3 |

*Table 1. Code conversion. Note 1: "Figs" and "ltrs" were included in this chart so that you can manually produce them with an ASCII keyboard. The program produces them automatically whenever needed. They are included for testing only. Note 2: The "stop" or British pound symbol (depends on the receiving machine) can be sent by typing a "+" on your ASCII keyboard. Note 3: The "bell" can be sent by typing a "*" on your ASCII keyboard. Other ASCII keys are "illegal" and will not produce a Baudot equivalent.*

deserves some comment on the methods used. After initialization of the ltrs/figs flag, the computer awaits input from an ASCII keyboard. Upon receiving that, it JSRs to a subroutine called STATUS where the incoming data is tested. If bit 6 is found to be a zero, the ASCII data was either a number or punctuation. In either case, the computer must check whether the last character sent was also in uppercase Baudot. If not, then the computer will have to send the figures command before it sends the character just input. If it determines that the last character was indeed uppercase, then all it needs to do is output the new character.

The same method holds true for lowercase, but in the reverse sense. The computer is initialized in the "ltrs" mode, since your first input will probably be a letter. Should you type a number or punctuation first, the computer will sense this and output a Baudot figures control and then your character.

Since we have chosen PB7 as the output pin for the transmit program, a 10k pull-up resistor will need to be added. PB7 on the KIM-1 has no internal pull-up (to permit collector-ORing with other devices). Simply connect a 10k ¼ W resistor from PB7 (A-15) and VCC (A-A).

Even before the computer has checked the status of the incoming character, it first rules out three special characters: space, line feed, and carriage return. A "space" produces the same effect as "unshift on space" in some mechanical printers. It's necessary as you're not going to have any idea of the kind of printer the other station will be using. If you type a string of numbers and then space to another string of numbers, the computer will shift down on the space and back up on the second string of numbers. The result to the user of this program or the station copying on the other end is insignificant. In other words, type whatever you want and you can be sure the other guy will copy regardless of the setup of his printer!

So why do we also disregard the line feed and carriage return as far as whether or not to send the figs/ltrs command? The main reason is that it simply does not matter whether a Baudot printer is in upper- or lowercase when either of these commands are sent. So the computer leaves you in the mode you are in.

After the status of the input character has been determined and figs/ltrs commands sent (if necessary), the character input is converted to Baudot, stored away, and then picked up by the XMT subroutine. Transmission of the resultant Baudot is accomplished in much the same manner as by a mechanical printer. The character is sent out, bit by bit, with a start bit (a space), five data bits, and a stop bit (a mark). The lengths of both the start and data bits are determined by the value loaded into the on-board KIM timer at location 03CD. Depending on the speed of transmission desired, load the value contained in Table 2. Likewise, since the stop bit is longer than a start/data bit, location 03E8 must have this delay constant loaded. The program is set for 60 wpm as written, since this is by far the most common speed for amateur RTTY trans-

PWR
NMI
IRQ
RST
AUD
VID
SST
RST
SST
A:
VID
B:
KIM-1/W8VQ PERIPHERAL INTERFACE ADAPTER

*Close-up of home brew interface box. Others might consider bringing all peripheral pins out to miniature phone jacks and all controls to outboard switches.*

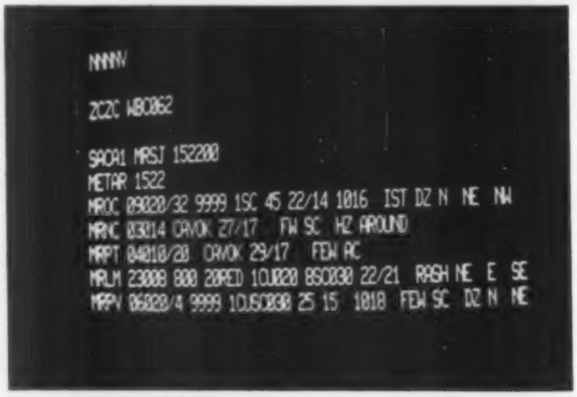
|  | 60 wpm | 66 wpm | 75 wpm | 100 wpm |
|---|---|---|---|---|
| **Baud rate** | 45.5 | 50.0 | 56.9 | 74.2 |
| **Start data (t = ms.)** | 22 | 20 | 18 | 13.33 |
| **Stop (t = ms.)** | 31 | 30 | 25 | 19 |
| **Normal total char. time (t = ms.)** | 163 | 150 | 133 | 99 |
| **KIM total char. time (t = ms.)** | 159.74 | 153.60 | 135.17 | 99.33 |
| **Percent error (Allow ± 5%)** | − 2.0 | + 2.4 | + 1.6 | + 0.3 |
| **Hex to load at 03CD** | 15 | 14 | 12 | 0D |
| **Hex to load at 03E8** | 1E | 1E | 18 | 13 |

*Table 2. RTTY timing table and delay constants. This table supplies data used by the RTTY transmit program. The values supplied for locations 03CD and 03E8 must be loaded if you want to transmit at a speed other than 60 wpm (the program is preset for this speed). Delay constants for receive are covered in WA5DXP's article.*[1]

missions. Change the above locations only if you desire another speed. Upon transmission of the complete character, the program loops to the beginning where the next input is awaited.

WB8VQD
BILL SCHMIDT

*Terminal unit provides both 60 mA loop for mechanical machine when we want hard copy and TTL level signals for the computer.*



```
NNNNV

ZCZC WBC062

SACA1 MRSJ 152200
METAR 1522
MROC 09020/32 9999 1SC 45 22/14 1016  IST DZ N  NE  NW
MRNC 03014 CAVOK 27/17   FW SC  HZ AROUND
MRPT 04010/20  CAVOK 29/17   FEW AC
MRLM 23008 800 20RED 1CU020 8SC030 22/21  RASH NE  E  SE
MRPV 06020/4 9999 1CU6C030 25 15  1018  FEW SC  DZ N  NE
```

*Example of weather broadcasts you'll be able to receive with the KIM. They are usually highly coded as this one is, but decoding manuals are available and we've found the NWS most helpful.*

Note that, when you type a character requiring a shift, there is a quick two-step sound as first the command for figs/ltrs is sent and then the character, separated only by a stop bit. You'll probably get comments on this from people with mechanical printers, as they'll be used to "live" typing which won't usually produce this effect. Also, if you're a very fast typist, you may have to pause slightly since the computer won't be ready for your next character until it's completed the above operation. Normal typists and pick-and-punchers can disregard this warning!

The program does more than just allow real-time transmission of RTTY. It also incorporates a buffer so you can type a short message into the computer and have it output the entire message at full speed. This is accomplished in the BUFFR section of the program. Getting into this mode requires only that you type "Control B" (that is, push the control key down and hold it down while you type a letter "B"). You'll notice that further typing is no longer output to your AFSK. Instead, anything you type is stored away in memory for "full speed ahead" transmission. How do you know if the buffer becomes full? Every character you type will return with a bell sounding if you're using a mechanical ASCII printer or a tone if you're using an electronic terminal. The program is set up to allow about a three-line (at 64 characters per line) buffer. You can change this at location 0332. Whenever you're finished typing your message into the buffer, it can be sent by typing "Control T." Remember to turn on your AFSK and transmitter first, though! When your entire message has been sent, the program again loops to the beginning and awaits your next input.

You can also load your ID into a special ID buffer which is always ready to be sent when you type "Control I." See Table 3 for initial loading instructions. Since you'll certainly dump this program to audio tape, every time you load, your program and also your ID will be ready to go. You can use the ID as we do or make a slight change. Since we send the ID at the end of our transmissions, we have completion of the ID automatically jump us into the receive program. This is accomplished at line 0321. If you want to use this program without WA5DXP's receive program, then you'll need to change only this one line (see Table 4). This ID is in RTTY, so you'll need to either ID verbally or in Morse to satisfy FCC requirements.

A few notes should be made about the actual ASCII-to-Baudot code conversion table (see Table 1). This table takes into account all normal Baudot characters. Figs and ltrs commands are included for testing, but, since the

**Step 1:** Decide what you want sent.
Example: "DE WB8VQD c/r c/r l/f"

**Step 2:** Convert it to ASCII using the chart below:

| | | |
|---|---|---|
| A-41 | N-4E | 1-31 |
| B-42 | O-4F | 2-32 |
| C-43 | P-50 | 3-33 |
| D-44 | Q-51 | 4-34 |
| E-45 | R-52 | 5-35 |
| F-46 | S-53 | 6-36 |
| G-47 | T-54 | 7-37 |
| H-48 | U-55 | 8-38 |
| I-49 | V-56 | 9-39 |
| J-4A | W-57 | 0-30 |
| K-4B | X-58 | space-20 |
| L-4C | Y-59 | c/r-0D |
| M-4D | Z-5A | l/f-0A |

**Step 3:** Place your ID into memory beginning at 0100.
Example:

| | | |
|---|---|---|
| 0010 | D | 44 |
| 0011 | E | 45 |
| 0012 | space | 20 |
| 0013 | W | 57 |
| 0014 | B | 42 |
| 0015 | 8 | 38 |
| 0016 | V | 56 |
| 0017 | Q | 51 |
| 0018 | D | 44 |
| 0019 | c/r | 0D |
| 001A | c/r | 0D |
| 001B | l/f | 0A |

**Step 4:** Tell the computer how long your ID is. This number, in hex, is loaded at 031E. If you're not familiar with hex, take the last location of your ID, add one, and use only the last digit. Example: My ID ends at 001B. If I add one, that's 001C. Using only the last digit, I get "0C" as the hex number to load at 031E. Disregard the number already at 031E.

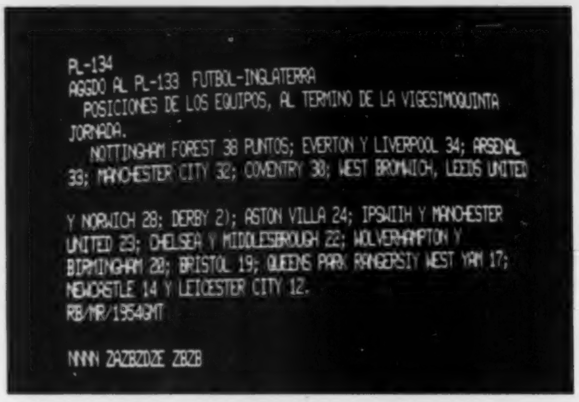
*Table 3. How to load the ID with your call.*

**Change:**

| | | | | |
|---|---|---|---|---|
| 0249 | 4C | D0 | 02 | JMP |
| 024C | EA | EA | | NOP |
| Add: | | | | |
| 02D0 | 2C | 40 | 17 | BIT SAD |
| 02D3 | 30 | 03 | | BMI |
| 02D5 | 4C | 00 | 03 | JMP Transmit |
| 02D8 | A9 | 80 | | LDAimm |
| 02DA | 2C | 00 | 17 | BIT PAD |
| 02DD | 4C | 4E | 02 | JMP Back to Rcv. |

*Table 4. Changes to WA5DXP's program to adapt it to this transmit program to allow transceive. WA5DXP's program appears in the October, 1977, issue of 73 Magazine. The above changes allow switching back and forth from receive to transmit without manually resetting the computer each time (see the article for details). If you want this program for transmit only and do not want to incorporate WA5DXP's receive program into it, only one line needs to be changed:*

| | | | | |
|---|---|---|---|---|
| *0321* | *F0* | *E1* | *EA* | *BEQ BEGIN (plus an NOP)* |



```
PL-134
AGGDO AL PL-133  FUTBOL-INGLATERRA
  POSICIONES DE LOS EQUIPOS, AL TERMINO DE LA VIGESIMOQUINTA
JORNADA.
   NOTTINGHAM FOREST 38 PUNTOS; EVERTON Y LIVERPOOL 34; ARSENAL
33; MANCHESTER CITY 32; COVENTRY 30; WEST BROMWICH, LEEDS UNITED

Y NORWICH 28; DERBY 2); ASTON VILLA 24; IPSWIIH Y MANCHESTER
UNITED 23; CHELSEA Y MIDDLESBROUGH 22; WOLVERHAMPTON Y
BIRMINGHAM 20; BRISTOL 19; QUEENS PARK RANGERSIY WEST YAM 17;
NEWCASTLE 14 Y LEICESTER CITY 12.
RB/MR/1954GMT

NNNN ZAZBZDZE ZBZB
```

*The computer won't mind foreign languages as this apparent sports broadcast proves. With the computer's ability to copy any speed, you'll be able to print much—but not all—of what you hear.*

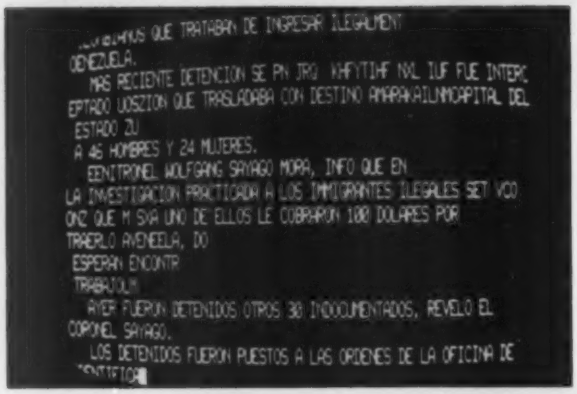
program supplies them automatically, you'll probably never use them. A Baudot "figs" is produced by typing "Control F" and a "ltrs" command by "Control L." If you are in the "ltrs" mode and type a "figs" command, you'll really get two of them, as the STATUS subroutine will supply one of its own! The same applies to typing the "ltrs" command when in the "figs" mode. Take this into account if you're inclined to experiment.

Delay constants for the transmit program appear in Table 2. Since only four speeds are legal on amateur bands, only constants for those are published. Percents of error are also included, as minor timing errors have not been corrected by the program. There's simply no need to, as any printer, mechanical or electronic, can handle errors up to 5%. Since we used the divide-by-1024 position of the KIM timer, even increments of milliseconds are not possible. Correction factors can be programmed in, but we found these constants plenty accurate for any use you'll probably ever encounter. One thing's for certain: A mechanical printer isn't going to care either way.

The receive program which we've referred to many times has performed well here for some time. We had considered writing one, but found this one to work so well we could see no sense in reinventing the wheel. We've copied everything from 60 to 100 wpm with no difficulty. If you're so inclined, the WX transmissions at 14.395 (LSB, 850 shift, 100 wpm) are a good deal of fun. Although the data is heavily coded, you'll see some plain English. This frequency is also one available quite near the top of a ham band and is accessible for those without a general-coverage receiver. You might also check out 7.405 (USB, 850 shift, usually 66 wpm) if you'd like to catch Spanish language telegrams. It's interesting and unusual to see the KIM decoding Spanish.

If you're in a QSO and want to get from receive back into transmit, type a space. At high speeds, the computer may not pick it up the first time. Try again. This is the sole purpose of the modification to WA5DXP's program appearing in Table 4. We didn't want to have to reset every time we wanted to send or receive. With this change, the computer is able to do all the work for you.

These programs have been used on the air in



```
IBIANOS QUE TRATABAN DE INGRESAR ILEGALMENT
OENEZUELA.
   MAS RECIENTE DETENCION SE PN JRQ  KHFYTIHF NXL IUF FUE INTERC
EPTADO UOSZION QUE TRASLADABA CON DESTINO AMARAKAILNMOAPITAL DEL
 ESTADO ZU
 A 46 HOMBRES Y 24 MUJERES.
   EENITRONEL WOLFGANG SAYAGO MORA, INFO QUE EN
LA INVESTIGACION PRACTICADA A LOS INMIGRANTES ILEGALES SET VOO
ONZ QUE M SXA UNO DE ELLOS LE COBRARON 100 DOLARES POR
TRAERLO AVENEELA, DO
 ESPERAN ENCONTR
 TRABAJOLM
   AYER FUERON DETENIDOS OTROS 30 INDOCUMENTADOS, REVELO EL
CORONEL SAYAGO.
   LOS DETENIDOS FUERON PUESTOS A LAS ORDENES DE LA OFICINA DE
NTIFICA
```

*News agencies, especially transmitting in Spanish, abound on the low bands. Copy is not perfect, but then we use a PLL-based TU and no filtering. A better TU should produce perfect copy!*

numerous QSOs and have been found to create a quiet and efficient RTTY station. Aside from the advantage of saving the output from a mechanical printer, we're inclined to think this is the RTTY of the future—no noise, no oil. There's an obvious plus to being able to send and receive at any speed without changing gears. Changing speeds is as easy as typing in a couple of sets of numbers.

Comments are welcomed and inquiries will be answered if you'll include an SASE. Our thanks also to K8NLM who spent countless hours on the air helping with operational tests and to WB8ZVL whose suggestions led to many of the ideas incorporated into the program. ■

**References**

1. "Try Your KIM-1 On RTTY," WA5DXP, *73 Magazine*, Oct., 1977.

2. "RTTY With The KIM," K4GCM, *73 Magazine*, Sept., 1977.

3. "KIM-1 Can Do It," W4CQI, *73 Magazine*, Feb., 1978.

**KIM-1 Sources/Information**

1. KIM Customer Service, Commodore International, 950 Rittenhouse Road, Norristown PA 19401.

2. Johnson Computer, P.O. Box 523, Medina OH 44256.

3. Computer Warehouse Store, 584 Commonwealth Ave., Boston MA 02215.

**Books and Newsletters**

1. "The First Book of KIM," ORB, P.O. Box 311, Argonne IL 60439, $9.00 postpaid, 176 pgs.

2. 6502 User Notes, PO Box 33093, N. Royalton OH 44133.

```
0300  A9  01       INIT     LDAimm        Initialize in
0302  85  04                STAzp          "ltrs" mode.
0304  20  5A  1E   BEGIN    JSR GETCHAR   Get ASCII data
0307  85  00                STAzp         Store data
0309  20  58  03            JSR STATUS
030C  4C  04  03            JMP BEGIN
030F  A2  00       ID       LDXimm        Clear X
0311  B5  10       ID+1     LDAzp,X       Start read at 0010
0313  85  00                STAzp         Store character
0315  86  01                STXzp         Save X
0317  20  58  03            JSR STATUS
031A  A6  01                LDXzp         Get X
031C  E8                    INX
031D  E0  0C                CPXimm        Done with ID?
031F  D0  F0                BNE ID+1
0321  4C  00  02            JMP RECEIVE
0324  A2  00       BUFFR    LDXimm        Clear X
0326  20  5A  1E   GETB     JSR GETCHAR   Input to buffer
0329  C9  14                CMPimm        Control "T"?
032B  F0  13                BEQ XMTB
032D  9D  00  01            STAabs,X      Store character
0330  E8                    INX
0331  E0  8F                CPXimm        Buffer full?
0333  B0  03                BCS BUFUL
0335  4C  26  03            JMP GETB
0338  A9  87       BUFUL    LDAimm        ASCII "Bell"
033A  20  A0  1E            JSR OUTCHAR    and ring it!
033D  4C  26  03            JMP GETB
0340  86  03       XMTB     STXzp         Store buffer limit
0342  A2  00                LDXimm        Clear X
0344  BD  00  01   XMTB+1   LDAabs,X      Read buffer
0347  86  02                STXzp         Save X
0349  85  00                STAzp         Store character
034B  20  58  03            JSR STATUS
034E  A6  02                LDXzp         Get X
0350  E8                    INX
0351  E4  03                CPXzp         Buffer limit reached?
0353  F0  AF                BEQ BEGIN
0355  4C  44  03            JMP XMTB+1
0358  A5  00       STATUS   LDAzp         Check character
035A  C9  20                CMPimm        "Space"?
035C  F0  14                BEQ LTRS
035E  C9  0A                CMPimm        "Line Feed"?
0360  F0  14                BEQ EXIT
0362  C9  0D                CMPimm        "Carriage Return"?
0364  F0  10                BEQ EXIT
0366  C9  09                CMPimm         Control "I"?
0368  F0  A5                BEQ ID
036A  C9  02                CMPimm         Control "B"?
036C  F0  B6                BEQ BUFFR
036E  24  00                BITzp          Test character
0370  50  29                BVC FIGS       Bit 6 = zero?
0372  A5  04       LTRS     LDAzp          Test Status Flag
0374  F0  0B                BEQ SETL       If "figs", reset.
0376  A5  00       EXIT     LDAzp          Get character
0378  AA                    TAX            Put in X register
0379  B5  00                LDAzp,X        Look-up Baudot
037B  85  00                STAzp          Store conversion
037D  20  BE  03            JSR XMT         and send it.
0380  60                    RTS
0381  A9  01       SETL     LDAimm         Set flag to "ltrs"
0383  85  04                STAzp
0385  A5  00                LDAzp          Retrieve character
0387  85  05                STAzp          Temp. Char. Store
0389  A9  7E                LDAimm         Baudot "ltrs" command
038B  85  00                STAzp          Store it
038D  20  BE  03            JSR XMT         and send it.
```

```
0390  A5  05                 LDAzp         Retrieve character
0392  AA                     TAX           Put in X register
0393  B5  00                 LDAzp,X       Look-up Baudot
0395  85  00                 STAzp         Store it
0397  20  BE  03             JSR XMT        and send it.
039A  60                     RTS
039B  A5  04       FIGS      LDAzp         Test Status Flag
039D  F0  1A                 BEQ XNORM-2
039F  A9  00                 LDAimm        If "ltrs", reset.
03A1  85  04                 STAzp
03A3  A5  00                 LDAzp         Retrieve character
03A5  85  05                 STAzp         Temp. Char. Store
03A7  A9  6E                 LDAimm        Baudot "figs" command
03A9  85  00                 STAzp         Store it
03AB  20  BE  03             JSR XMT
03AE  A5  05                 LDAzp         Retrieve character
03B0  AA           XNORM-1   TAX           Put in X register
03B1  B5  00                 LDAzp,X       Look-up Baudot
03B3  85  00                 STAzp         Store conversion
03B5  20  BE  03             JSR XMT
03B8  60                     RTS
03B9  A5  00       XNORM-2   LDAzp         Retrieve character
03BB  4C  B0  03             JMP XNORM-1
03BE  A0  00       XMT       LDYimm        Clear Y
03C0  A9  80                 LDAimm        Define PB7= output
03C2  8D  03  17             STAabs PBDD
03C5  A5  00       LETR      LDAzp         Get stored Baudot
03C7  29  80                 ANDimm        Clear bits 6-ø
03C9  8D  02  17             STAabs PBD
03CC  A9  15        SETT     LDAimm     Time= 22ms.
03CE  8D  07  17             STAabs
03D1  2C  07  17    TCHK-1   BITabs     Time-out?
03D4  10  FB                 BPL TCHK-1 No? Wait.
03D6  C8                     INY        Set up next bit
03D7  C0  06                 CPYimm     Start/Data done?
03D9  F0  05        DONE     BEQ STPBT
03DB  06  00                 ASLzp      Get next bit
03DD  4C  C5  03             JMP LTR
03E0  06  00        STPBT    ASLzp      Get stop bit
03E2  A5  00                 LDAzp
03E4  8D  02  17             STAabs PBD Stop bit @ PB7
03E7  A9  1E                 LDAimm     Time= 31ms.
03E9  8D  07  17             STAabs
03EC  2C  07  17    TCHK-2   BITabs     Time-out?
03EF  10  FB                 BPL TCHK-2 No? Wait.
03F1  60                     RTS


END



Reserved Locations:

0000      -    Character Store (Primary)
0001      -    Save X  #1
0002      -    Save X  #2
0003      -    Buffer Limit Store
0004      -    Ltrs/Figs Status Flag
0005      -    Character Store (Temporary)

0010-001F-     ID Storage Area (Maximum Length= 16 characters)
               (See Table 3 for instructions)

. . . and see Table 1 for other reserved zero page locations.
```

*Fig. 1. Program listing.*

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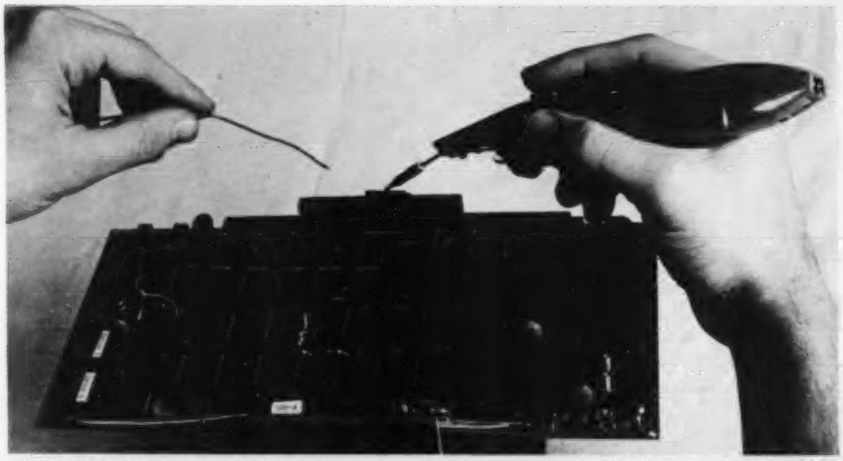

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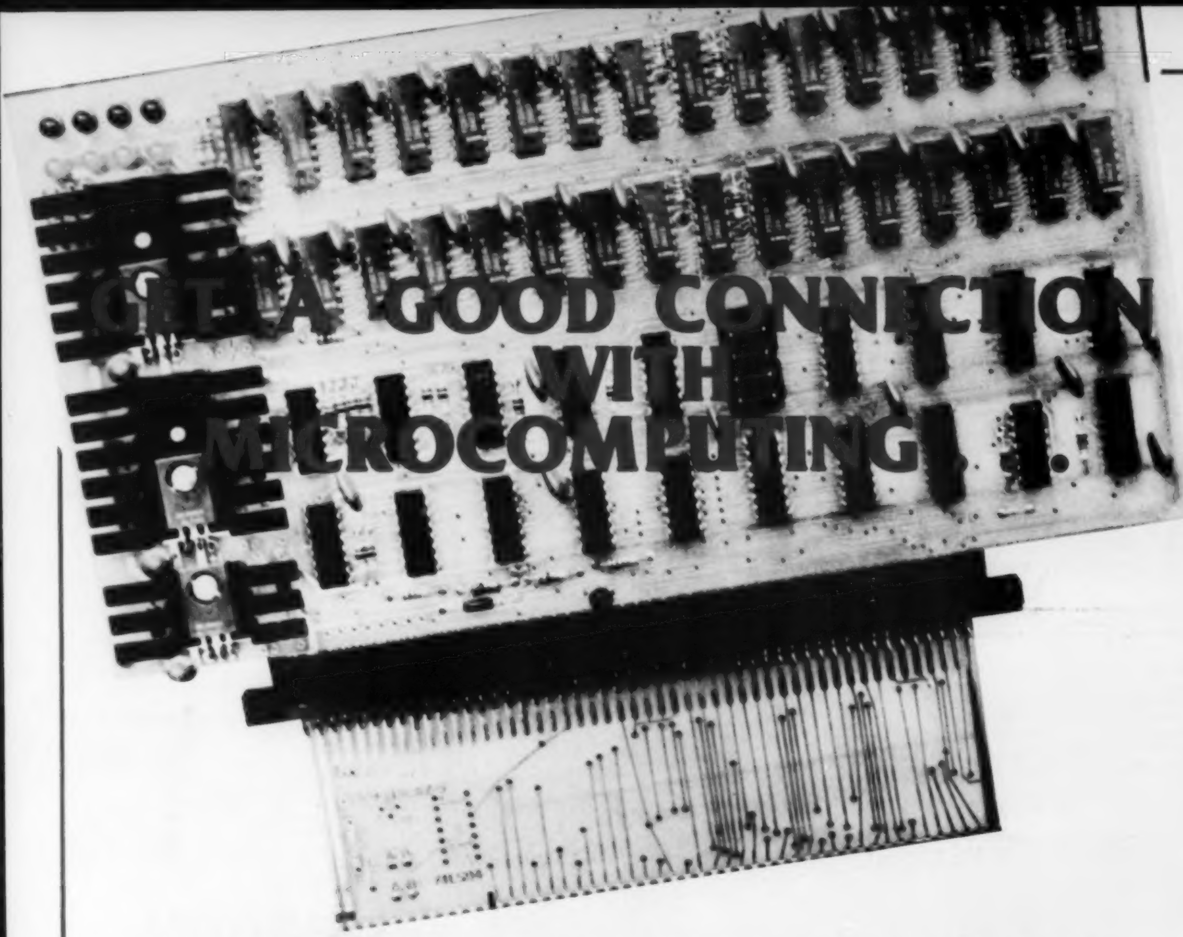

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**SPACE TREK III** Let yourself go to the far ends of the solar system—and beyond. This package includes:

- **Stellar Wars**—Shoot down the Tie fighters and destroy the Death Star.
- **Planetary Lander**—Land your spacecraft and plant your flag across the solar system.

These one player games require a TRS-80 Level I 4K. **Order No. 0031R $7.95.**

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**SPACE TREK IV** Trade or wage war on a planetary scale. This package includes:

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- **Population Simulation**—A two player game where you control the economy of two neighboring planets.

You decide, guns or butter, with your TRS-80 Level II 16K. **Order No. 0034R $7.95.**

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**TREK-X**Command the Enterprise as you scour the quadrant for enemy warships. This package not only has superb graphics, but includes programming for optional sound effects. A one player game for the PET 8K. **Order No. 0032P $7.95.**

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**CAR RACE/RAT TRAP/ANTIAIRCRAFT** Enjoy these challenging, fun filled programs:

- **Car Race**—You and a friend can race on a choice of two tracks.
- **Rat Trap**—Trap the rat in his maze with your two cats. For one player.
- **Antiaircraft**—Aim and shoot down the enemy airplane. Requires Level I 4K TRS-80. **Order No. 0011R $7.95.**

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**PENNY ARCADE** Enjoy this fun filled package that's as much fun as a real penny arcade—at a fraction of the cost!

- **Poetry**—Compose free verse poetry on your computer.
- **Trap**—Control two moving lines at once and test your coordination.
- **Poker**—Play five card draw poker and let your PET deal and keep score.
- **Solitaire**—Don't bother to deal, let your PET handle the cards in this "old favorite" card game.
- **Eat-Em-Ups**—Find out how many stars your gobbler can eat up before the game is over.

These six programs require the PET with 8K. **Order No. 0044P $7.95.**

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**RAMROM PATROL/TIE FIGHTER/KLINGON CAPTURE** Buck Rogers never had it so good. Engage in extraterrestrial warfare with:

- **Ramrom Patrol**—Destroy the Ramrom ships before they capture you.
- **Tie Fighter**—Destroy the enemy Tie fighters and become a hero of the rebellion.
- **Klingon Capture**—You must capture the Klingon ship intact. It's you and your TRS-80 Level II 16K battling across the galaxy. **Order No. 0028R $7.95.**

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**QUBIC-4/GO-MOKU** Play two ancient games on your modern PET. The two programs included are:

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- **Go-Moku**—Line up five of your men while blocking the PET's moves.

These one player games require 8K of memory. **Order No. 0038P $7.95.**

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LEVEL II
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Enjoy these exciting and graphically beautiful programs. For one or two players with an 8K PET. **Order No. 0029P $7.95.**

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**CAVE EXPLORING/YACHT/CONCENTRATION** These three programs are not only fun, but stimulating as well:

- **Cave Exploring**—Search for fabulous treasures as you explore the magic cave. For one player.
- **Yacht**—One player can enjoy this game based on Yahtzee.
- **Concentration**—Two players can pit their memories in this program based on the popular television show. You'll need a TRS-80 with Level I and 16K. **Order No. 0010R $7.95.**

---

**DESTROY ALL SUBS/GUNBOATS/BOMBER** This package of three programs is fun for the whole family. Included are:

- **Destroy All Subs**—Hunt down enemy subs while avoiding mines and torpedoes. A one player game.
- **Gunboats**—One or two players can try to blow each others ships out of the water.
- **Bomber**—Carefully release your bomb to destroy the moving submarine. A one player game.

To enjoy these programs you'll need a TRS-80 Level I 4K. **Order No. 0021 R $7.95.**

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**KNIGHT'S QUEST/ROBOT CHASE/HORSE RACE** This varied package of one player games will give you hours of fun.

- **Knight's Quest**—Battle demons to gain treasure and become a full fledged knight.
- **Robot Chase**—Destroy the deadly robots without electrocuting yourself.
- **Horse Race**—Place your bet and cheer your horse to the finish line.

These programs require a TRS-80 Level I 16K. **Order No. 0003R $7.95.**

**DEMO I** This package is just the thing to show your friends what your TRS-80 can do. Included are:

- **Computer Composer**—Compose and play music using only a standard AM radio.
- **Baseball**—Play baseball with your computer while it does the scorekeeping.
- **Horse Race**—Place your bet and cheer your pony to the winner's circle.
- **ESP**—Test your powers of extrasensory perception.
- **Hi-Lo/Tic-tac-toe**—Guess the secret number or get three in a row.
- **Petals Around the Rose**—Can you figure out the secret behind the five dice?
- **Slot Machine**—Turn your computer into a one-armed bandit. These programs require a TRS-80 Level I 4K. **Order No. 0020R $7.95.**

---

**BASIC AND INTERMEDIATE LUNAR LANDER** Bring your lander in under manual control. The Basic version is for beginners; the Intermediate version is more difficult, with a choice of landing areas and rugged terrain. For one player with a TRS-80 Level I 4K, Level II 16K. **Order No. 0001R $7.95.**

## Business

**BUSINESS PACKAGE I** Keep the books for a small business with your TRS-80 Level I 4K. The six programs included are:

- **General Information**—The instructions for using the package.
- **Fixed Asset Control**—This will give you a list of your fixed assets and term depreciation.
- **Detail Input**—This program lets you create and record your general ledger on tape for fast access.
- **Month and Year to Date Merge**—This program will take your monthly ledger data and give you a year to date ledger.
- **Profit and Loss**—With this program you can quickly get trial balance and profit and loss statements.
- **Year End Balance**—This program will combine all your data from the profit and loss statements into a year end balance sheet.

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**BUSINESS PACKAGE III** This package can change your TRS-80 into a full working partner for any businessman:

- **Inventory**—Maintain a computer-based inventory for a constant inventory system.
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**CHECKERS/BACARRAT** Play two old favorites with your PET.

- **Checkers**—Let your PET be your ever-ready opponent in this computer-based checkers program.
- **Bacarrat**—You have both Casino and Blackjack-style games in this realistic program.

Your PET with 8K will offer challenging play anytime you want. **Order No. 0022P $7.95.**

**CASINO II** This craps program is so good, it's the next best thing to being in Las Vegas or Atlantic City. It will not only play the game with you, but also will teach you how to play the odds and make the best bets. A one player game, it requires a PET 8K. **Order No. 0015P $7.95.**

**AIR FLIGHT SIMULATION** Turn your TRS-80 into an airplane. You can practice takeoffs and landings with the benefit of full instrumentation. This one-player simulation requires a TRS-80 Level I 4K, Level II 16K. **Order No. 0017R $7.95.**

**GOLF/CROSSOUT** Have fun with these exciting one-player games. Included are:

- **Golf**—You won't need a mashie or putter—or a caddie, for that matter, to enjoy a challenging 18 holes.
- **Crossout**—Remove all but the center peg in this puzzle and your neighbors will call you a genius.

You'll need a TRS-80 Level I 4K, Level II 16K. **Order No. 0009R $7.95.**

**GOLF** Without leaving the comfort of your chair, you can enjoy a computerized 18 holes of golf with a complete choice of clubs and shooting angles. You need never cancel this game because of rain. One or two players can enjoy this game on the Apple with Applesoft II and 20K. **Order No. 0018A $7.95.**

**DOW JONES** Up to six players can enjoy this exciting stock market game. You can buy and sell stock in response to changing market conditions. Get a taste of what playing the market is all about. Requires a PET with 8K. **Order No. 0026P $7.95.**

**HEX PAWN/SHUTTLE CRAFT DOCKING/SPACE CHASE/ BATTLESHIP** This four-game package is sure to provide hours of fun for the whole family.

- **Hex Pawn**—Turn your TRS-80 into a model of artificial intelligence by playing a simple game.
- **Shuttle Craft Docking**—Land your shuttle craft on the starship—even through varying gravity fields!
- **Space Chase**—Seek out and destroy the enemy delta that's hidden in the star field.
- **Battleship**—You must find and destroy the enemy fleet.

This package requires a TRS-80 Level I 16K. **Order No. 0041R $7.95.**

**SANTA PARAVIA AND FIUMACCIO** Become the ruler of a medieval city-state as you struggle to create a kingdom. Up to six players can compete to see who will become the King or Queen first. This program requires a TRS-80 Level I & II. **Order No. 0043R $7.95.**

**CARDS** This one-player package will let you play cards with your TRS-80—talk about a poker face!

- **Draw and Stud Poker**—These two programs will keep your game sharp.
- **No-Trump Bridge**—Play this popular game with your computer and develop your strategy.

The package name says it all. Requires a TRS-80 Level II 16K. **Order No. 0063R $7.95.**

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**BACKGAMMON/KENO** Why sit alone when you can play these fascinating games with your TRS-80?

- **Backgammon**—Play against the computer. Your TRS-80 will give you a steady challenging game that's sure to sharpen your skills.
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- **Blackjack**—Try out this version of the popular card game before you go out and risk your money on your own "surefire" system. For one player.

This package requires a PET with 8K. **Order No. 0014P $7.95.**

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- **Status of Homes**—This program will allow you to keep track of all the expenses involved in building one house or an entire subdivision.
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# Keyboard Konvenience

## —simplify entry of BASIC programs

**Throw in an LED for good measure.**

*Rod Hallen WA7NEV*
*Road Runner Ranch*
*PO Box 73*
*Tombstone AZ 85638*

I recently replaced my uppercase-only keyboard with one that generates both upper- and lowercase letters because word processing is one of my personal computing goals. However, this necessitates constantly shifting when entering BASIC and assembly language programs. The two circuits here (Figs. 1 and 2) allow either uppercase only or both upper- and lowercase operation at the flip of a switch. Numbers, punctuation, etc., are still under the control of the shift key. Both circuits are different methods of implementing the same function depending on what type of IC gates you have available.

The LED indicates upper- and lowercase operation, but it can be eliminated since the position of the switch or the operation of the keyboard will indicate which mode has been chosen. I just like lots of lights.■

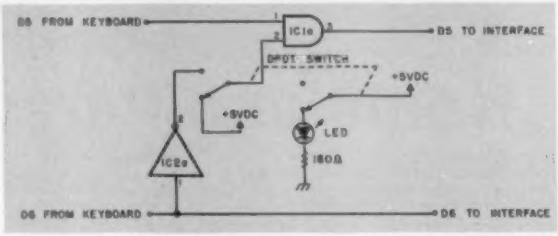
D5 FROM KEYBOARD
1
IC1a
3
2
D5 TO INTERFACE
DPDT SWITCH
+5VDC
2
+5VDC
LED
IC2a
180Ω
1
D6 FROM KEYBOARD
D6 TO INTERFACE

*Fig. 1. IC1a = SN7408N AND gate. IC2a = SN7404N inverter. Pin 14 is + 5 V dc on both ICs and pin 7 is ground.*

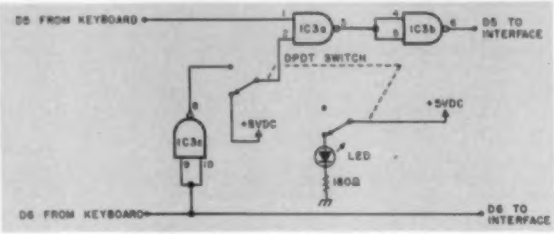
D5 FROM KEYBOARD
1
IC3a
3
2
4
IC3b
5
6
D5 TO INTERFACE
DPDT SWITCH
8
+5VDC
+5VDC
IC3c
9
10
LED
180Ω
D6 FROM KEYBOARD
D6 TO INTERFACE

*Fig. 2. IC3a, b, and c = SN7400N. Pin 14 is + 5 V dc and pin 7 is ground.*

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-6502 CPU, 8K user RAM (expandable), 14K operating system with 10 digit BASIC, file control system, cassette operating system. This is one of the fastest interpreter BASICS available.
-72 Key Keyboard with all ASCII characters available without shift. Lower case and graphics available with shift.
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-Program editing uses movable cursor to INSERT & DELETE characters ANYWHERE on the screen! No need to retype lines.
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-Two I/O methods standard: 8Bit parallel port w/handshake, and IEEE-488 bus for multiple peripherals. IEEE supports high speed 8 bit transfer to any of 15 different devices on-line simultaneously
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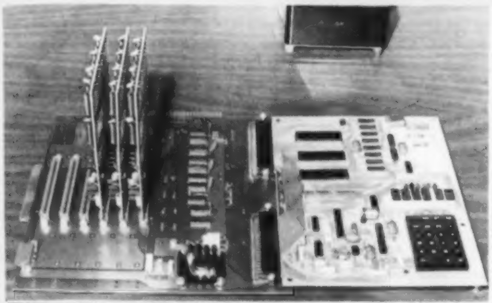

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-Powerful 6502 microprocessor, now second sourced by 4 manufactureres (plus Commodore/Mos). 13 addressing modes and advanced architecture result in an eff.cient, fast, and easy to program computer.
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-Expand with a full size or minifloppy disk from HDE (write) The KIM bus is now supported by numerous manufacturers including Rockwell Int'l, Synertek, RNB, HDE the Computerist.
-Well proven design-over 40,000 in the field. KIM-1 with documentation-**$179.00**: Power supply, 5V and 12V, 8-V at 4 amps, 16 V at 1 amp-**$40.00**: KIM-4 motherboard **$119.00** HDE 8K RAM **$169.00**, 3 for **$465.00**! : HDE proto board **$49.50.**

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# DXCC in One Sitting

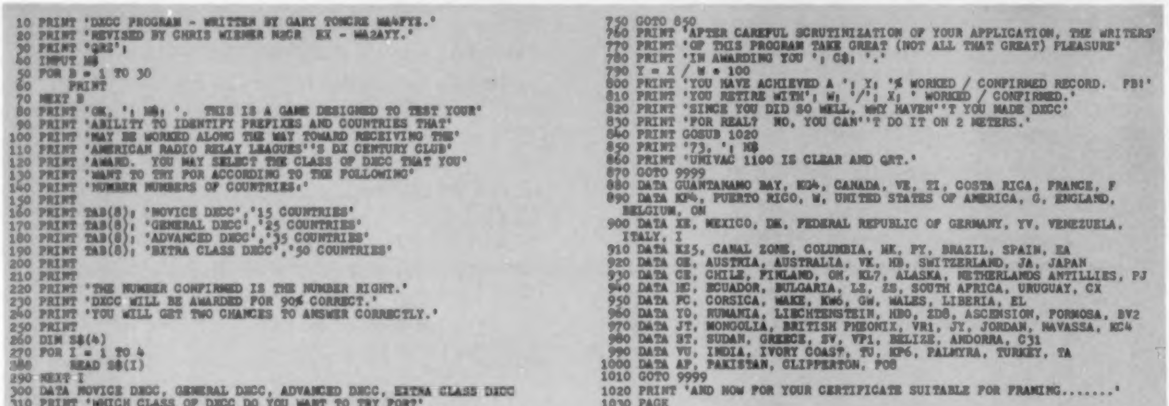
## —know your prefixes

**You don't even need a ticket.**

*Gary H. Toncre WA4FYZ*
*13764 SW 54th Lane*
*Miami FL 33175*

*Chris Wiener N2CR*
*10 Elm Street*
*Tenafly NJ 07670*

Would you believe it's possible to work DXCC when the band isn't open? Well, you can work DXCC even if you don't have a ham license. It's not



```
  10 PRINT 'DXCC PROGRAM - WRITTEN BY GARY TONCRE WA4FYZ.'
  20 PRINT 'REVISED BY CHRIS WIENER N2CR  EX - WA2AYY.'
  30 PRINT 'QRZ';
  40 INPUT H$
  50 FOR B = 1 TO 30
  60     PRINT
  70 NEXT B
  80 PRINT 'OK, '; H$; '.  THIS IS A GAME DESIGNED TO TEST YOUR'
  90 PRINT 'ABILITY TO IDENTIFY PREFIXES AND COUNTRIES THAT'
 100 PRINT 'MAY BE WORKED ALONG THE WAY TOWARD RECEIVING THE'
 110 PRINT 'AMERICAN RADIO RELAY LEAGUES''S DX CENTURY CLUB'
 120 PRINT 'AWARD.  YOU MAY SELECT THE CLASS OF DXCC THAT YOU'
 130 PRINT 'WANT TO TRY FOR ACCORDING TO THE FOLLOWING'
 140 PRINT 'NUMBER NUMBERS OF COUNTRIES:'
 150 PRINT
 160 PRINT TAB(8); 'NOVICE DXCC','15 COUNTRIES'
 170 PRINT TAB(8); 'GENERAL DXCC','25 COUNTRIES'
 180 PRINT TAB(8); 'ADVANCED DXCC','35 COUNTRIES'
 190 PRINT TAB(8); 'EXTRA CLASS DXCC','50 COUNTRIES'
 200 PRINT
 210 PRINT
 220 PRINT 'THE NUMBER CONFIRMED IS THE NUMBER RIGHT.'
 230 PRINT 'DXCC WILL BE AWARDED FOR 90% CORRECT.'
 240 PRINT 'YOU WILL GET TWO CHANCES TO ANSWER CORRECTLY.'
 250 PRINT
 260 DIM S$(4)
 270 FOR I = 1 TO 4
 280     READ S$(I)
 290 NEXT I
 300 DATA NOVICE DXCC, GENERAL DXCC, ADVANCED DXCC, EXTRA CLASS DXCC
 310 PRINT 'WHICH CLASS OF DXCC DO YOU WANT TO TRY FOR?'
 320 PRINT 'ENTER THE CLASS EXACTLY AS LISTED ABOVE';
 330 INPUT C$
 340 IF C$ = S$(1) THEN 380
 350 IF C$ = S$(2) THEN 400
 360 IF C$ = S$(3) THEN 420
 370 IF C$ = S$(4) THEN 440 ELSE 310
 380 N = 15
 390 GOTO 445
 400 N = 25
 410 GOTO 445
 420 N = 35
 430 GOTO 445
 440 N = 50
 445 FOR I = 1 TO 30 PRINT
 450 PRINT 'IF THE COUNTRY IS AN ISLAND, THEN THE WORD ''ISLAND'' IS';
 460 PRINT ' NOT IN THE NAME.'
 470 PRINT 'ALL COUNTRY NAMES ARE TAKEN FROM THE ARRL''S DXCC LIST.'
 475 FOR I = 1 TO 4 PRINT
 480 L$(0) = 'WRONG, LID.  THERE IS A BAND OPENING.  TRY AGAIN.'
 490 L$(1) = 'SURE YOU WOULDN''T RATHER TRY FOR WAS? THE CORRECT ANSWER:'
 500 W = 0
 510 X = 0
 520 FOR I = 1 TO N
 530         READ Q$, A$
 540         T = 0
 550         PRINT Q$
 560         INPUT G$
 570         IF A$ = G$ THEN 650
 580         IF T = 0 THEN PRINT L$(0)
 590         IF T = 1 THEN PRINT L$(1);
 600         T = T + 1
 610         IF T = 1 THEN 550
 620         PRINT A$
 630         W = W + 1
 640         GOTO 680
 650         PRINT 'CORRECT, NICE GUESS.'
 660         W = W + 1
 670         X = X + 1
 680         PRINT 'YOU NOW HAVE'; W; '/'; X; 'WORKED / CONFIRMED.'
 690         FOR K = 1 TO 4 PRINT
 700         P = 0.9 * N
 710         IF X> = P THEN 760
 720 NEXT I
 730 PRINT 'LID.  SUGGEST YOU TRY NEXT LOWER CLASS'
 740 PRINT 'OR TAKE UP COMPUTER PROGRAMMING.  BETTER YET, GO CB.'
 750 GOTO 850
 760 PRINT 'AFTER CAREFUL SCRUTINIZATION OF YOUR APPLICATION, THE WRITERS'
 770 PRINT 'OF THIS PROGRAM TAKE GREAT (NOT ALL THAT GREAT) PLEASURE'
 780 PRINT 'IN AWARDING YOU '; C$; '.'
 790 Y = X / W * 100
 800 PRINT 'YOU HAVE ACHIEVED A '; Y; '% WORKED / CONFIRMED RECORD.  FB!'
 810 PRINT 'YOU RETIRE WITH'; W; '/'; X; ' WORKED / CONFIRMED.'
 820 PRINT 'SINCE YOU DID SO WELL, WHY HAVEN''T YOU MADE DXCC'
 830 PRINT 'FOR REAL?  NO, YOU CAN''T DO IT ON 2 METERS.'
 840 PRINT GOSUB 1020
 850 PRINT '73, '; H$
 860 PRINT 'UNIVAC 1100 IS CLEAR AND QRT.'
 870 GOTO 9999
 880 DATA GUANTANAMO BAY, KG4, CANADA, VE, TI, COSTA RICA, FRANCE, F
 890 DATA KP4, PUERTO RICO, W, UNITED STATES OF AMERICA, G, ENGLAND,
   BELGIUM, ON
 900 DATA XE, MEXICO, DK, FEDERAL REPUBLIC OF GERMANY, YV, VENEZUELA,
   ITALY, I
 910 DATA KZ5, CANAL ZONE, COLUMBIA, HK, PY, BRAZIL, SPAIN, EA
 920 DATA OE, AUSTRIA, AUSTRALIA, VK, HB, SWITZERLAND, JA, JAPAN
 930 DATA CE, CHILE, FINLAND, OH, KL7, ALASKA, NETHERLANDS ANTILLIES, PJ
 940 DATA HC, ECUADOR, BULGARIA, LZ, ZS, SOUTH AFRICA, URUGUAY, CX
 950 DATA FC, CORSICA, WAKE, KW6, GW, WALES, LIBERIA, EL
 960 DATA YO, RUMANIA, LIECHTENSTEIN, HB0, ZD8, ASCENSION, FORMOSA, BV2
 970 DATA JT, MONGOLIA, BRITISH PHEONIX, VR1, JY, JORDAN, NAVASSA, KC4
 980 DATA ST, SUDAN, GREECE, SV, VP1, BELIZE, ANDORRA, C31
 990 DATA VU, INDIA, IVORY COAST, TU, KP6, PALMYRA, TURKEY, TA
1000 DATA AP, PAKISTAN, CLIPPERTON, FO8
1010 GOTO 9999
1020 PRINT 'AND NOW FOR YOUR CERTIFICATE SUITABLE FOR FRAMING.......'
1030 PAGE
1040 FOR I = 1 TO 66
1050      PRINT '-';
1060 NEXT I
1070 PRINT
1080 PRINT TAB(11); 'GARY TONCRE WA4FYZ AND CHRIS WEINER N2CR'
1090 PRINT TAB(13); '   AWARD '; H$; ' AN HONORARY COMPUTER'
1100 PRINT TAB(26); C$
1110 PRINT
1120 PRINT TAB(10);'DDDDDDDDD    XX       XX     CCCCCC       CCCCCC'
1125 PRINT TAB(10);'DDDDDDDDDD   XX       XX     CCCCCC       CCCCCC'
1130 PRINT TAB(10);'DD      DD     XX   XX     CC       CC   CC       CC'
1135 PRINT TAB(10);'DD      DD     XX   XX     CC       CC   CC       CC'
1140 PRINT TAB(10);'DD      DD       XX        CC            CC'
1145 PRINT TAB(10);'DD      DD       XX        CC            CC'
1150 PRINT TAB(10);'DD      DD       XX        CC            CC'
1155 PRINT TAB(10);'DD      DD       XX        CC            CC'
1160 PRINT TAB(10);'DD      DD       XX        CC            CC'
1165 PRINT TAB(10);'DD      DD       XX        CC            CC'
1170 PRINT TAB(10);'DD      DD     XX   XX     CC       CC   CC       CC'
1175 PRINT TAB(10);'DD      DD     XX   XX     CC       CC   CC       CC'
1180 PRINT TAB(10);'DDDDDDDDDD   XX       XX     CCCCCC       CCCCCC'
1185 PRINT TAB(10);'DDDDDDDDD    XX       XX     CCCCCC       CCCCCC'
1190 PRINT
1200 FOR I = 1 TO 66
1210      PRINT '-';
1230 NEXT I
1240 FOR I = 1 TO 4
1250      PRINT
1260 NEXT I
1270 RETURN
1280 GOTO 9999
1290 FOR Y = 1 TO 30
1300      PRINT
1310 NEXT Y
9999 END


RUN

DXCC          11:49:37      3 APR 78


DXCC PROGRAM - WRITTEN BY GARY TONCRE WA4FYZ
REVISED BY CHRIS WEINER N2CR  EX - WA2AYY.
QRZ?  >WA2GMO
```

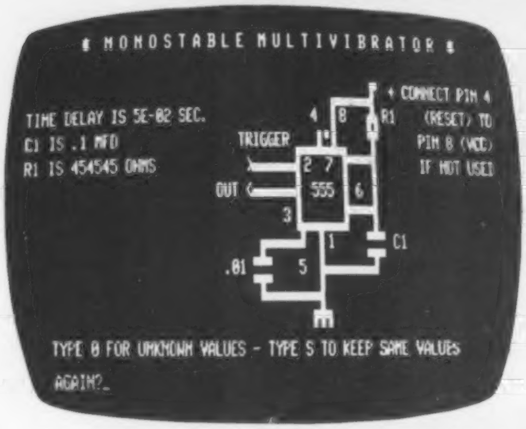
*Fig. 1. Program listing.*

# Get a load of Instant Software and ENTER a whole new world of electronics design with your TRS-80

Turn your TRS-80 into the most versatile tool on your workbench. The Electronics I and Ham Package I series of programs will save you hours of tedious calculations. You can design circuits in a fraction of the time it took you previously. These programs will draw a complete schematic diagram of your desired circuit with all components labeled. You can even design a circuit around parts on hand! And you'll get your designs off the drawing board and into production FAST. Save time, money, and energy as you get more fun out of electronics!

## Electronics I

Level I 4K, Level II 16K



```
* MONOSTABLE MULTIVIBRATOR *

TIME DELAY IS 5E-02 SEC.
C1 IS .1 MFD
R1 IS 454545 OHMS

TYPE 0 FOR UNKNOWN VALUES - TYPE S TO KEEP SAME VALUES
AGAIN?_
```

If you're still designing circuits the old fashioned way, let the Electronics I package introduce the latest way to go:

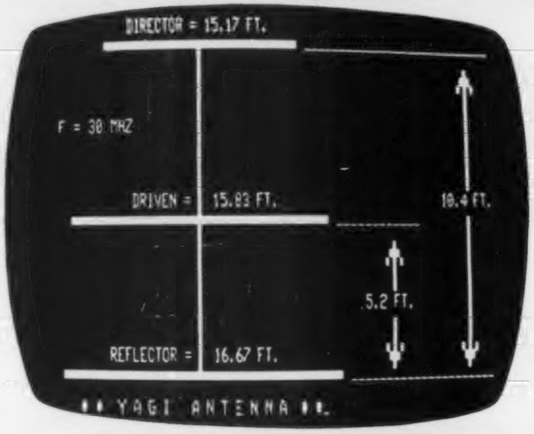
Tuned Circuits and Coil Winding—Design tuned circuits for audio and radio frequencies. This two part program will find the missing two values from any two of the following, frequency, capacitance, inductance, or reactance. The coil winding section will calculate the number of turns and wire gauge required for a close wound, air or slug tuned coil from the inductance, diameter, length, and permeability of the coil.

555 Timer Circuits—Timers, both monostable (one-shot) and astable (oscillator), can be easily designed with this two part program. The program will also draw a complete schematic on the screen of your TRS-80.

LM381 Preamp Design—You too can quickly design an IC preamp. With this program all you need to do is enter the parameters of the performance you want, and the program does the rest—right down to drawing a detailed schematic of your circuit on the screen!

## Ham Package I

Level I 4K, Level II 16K



Ham Package I—We had to call it something, but this package is not only for hams. It's great for any experimenter or technician in need of a dynamic reference of popular electronics formulae. The included programs will calculate:

1. Ohms Law—Easily performs calculations involving voltage, current, resistance, and power.
2. Series and Parallel Calculations—Find the value for capacitors or resistors in parallel or series circuits.
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easy, but the award is commensurate with the effort put forth. So jump in with both feet and try your luck with Computer DXCC. If you don't want to use this program as is, read on. It is adaptable to many other uses.

The original program was adapted from a quiz program in *Basic Programming* by Kemeny and Kurtz. Over a period of some six months, we have updated the program again and again. Somehow, every time we work a new country, it ends up being in the program!

### The Program

The program as listed gives complete instructions in the opening lines. Line 30 asks for your name or call, and it is stored as H$.

The program allows you to select a "class" of DXCC, which is determined by the number of countries that you play. The maximum is 50 countries for the Extra Class DXCC. The countries are arranged in the data statements in an increasing order of difficulty.

You automatically win if you answer 90% correct. Thus, if you answer correctly the first 45 out of the 50 Extra Class countries, the program will go directly to the certificate awarded to the winners.

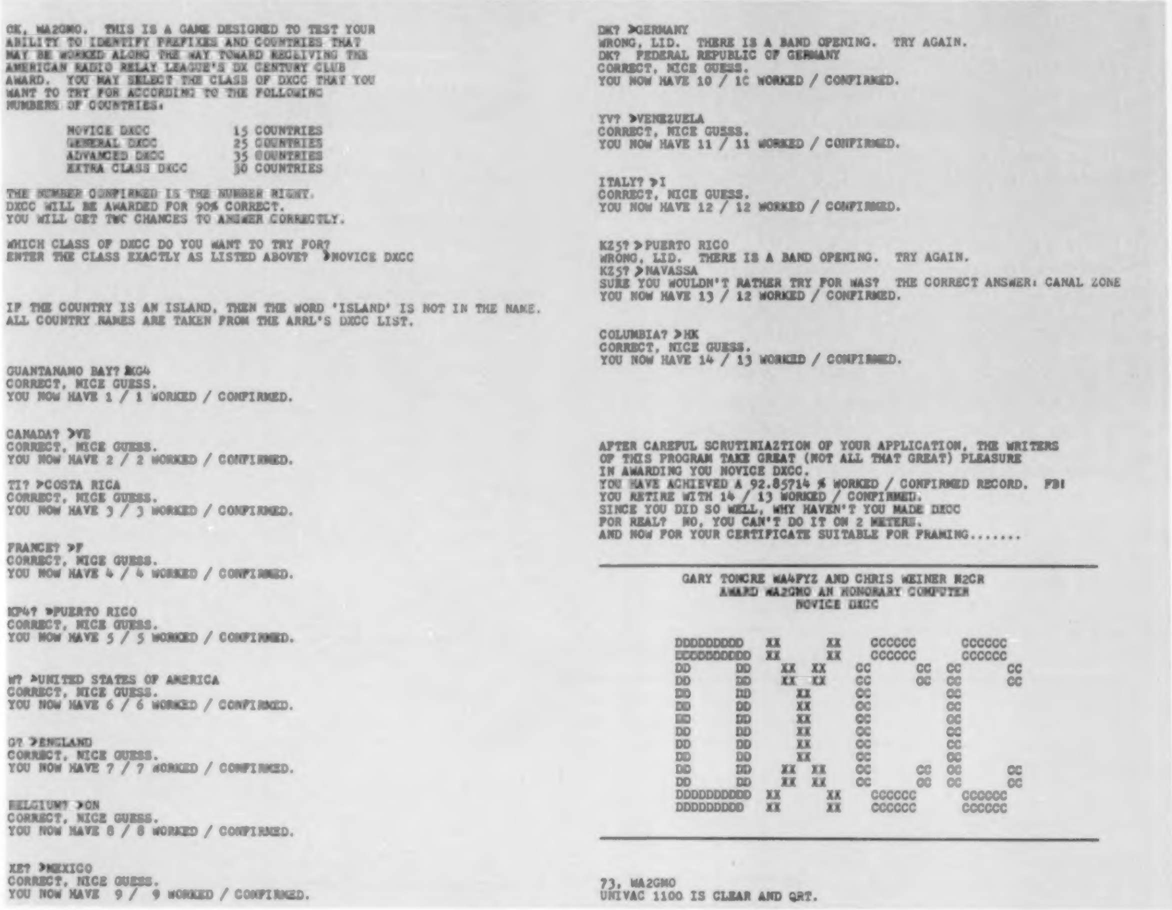
If a country name is given, you must supply the prefix. If the prefix is given, then you must supply the name of the country as it appears on the ARRL DXCC Country List. You are given two chances to answer each question without penalty. The number that you answered correctly is considered worked and confirmed. Wrong answers are considered as worked only. The program keeps track of your worked/confirmed record, as well as a percentage computed from them. A certificate is awarded to those who make the grade.

### Program Breakdown

Lines 10 to 150 supply information on how to play the game. Lines 160 to 440 set up the computer for the number of countries that you want to work (variable N in lines 380 to 440). Lines 500 and 510 set variables W (for your worked countries tally) and X (for those confirmed) equal to zero.

The main body of the program starts at line 520. The loop is completed at line 720 and is executed N times. Line 530 reads the first two pieces of data from line 880— in this case, "Guantanamo Bay" and "KG4." Notice that the data is set up to alternate the country's prefix and the country's name as the question.

Line 540 sets up variable T to keep track of whether your answer is the first or second try. Line 550 prints the country or prefix, and your answer is recorded in 560 as G$. If your answer is right, the program jumps to 650 and your worked and confirmed tallies are incremented by one each. The current record is



```
OK, WA2GMO.  THIS IS A GAME DESIGNED TO TEST YOUR
ABILITY TO IDENTIFY PREFIXES AND COUNTRIES THAT
MAY BE WORKED ALONG THE WAY TOWARD RECEIVING THE
AMERICAN RADIO RELAY LEAGUE'S DX CENTURY CLUB
AWARD.  YOU MAY SELECT THE CLASS OF DXCC THAT YOU
WANT TO TRY FOR ACCORDING TO THE FOLLOWING
NUMBERS OF COUNTRIES.

        NOVICE DXCC              15 COUNTRIES
        GENERAL DXCC             25 COUNTRIES
        ADVANCED DXCC            35 COUNTRIES
        EXTRA CLASS DXCC         50 COUNTRIES

THE NUMBER CONFIRMED IS THE NUMBER RIGHT.
DXCC WILL BE AWARDED FOR 90% CORRECT.
YOU WILL GET TWC CHANCES TO ANSWER CORRECTLY.

WHICH CLASS OF DXCC DO YOU WANT TO TRY FOR?
ENTER THE CLASS EXACTLY AS LISTED ABOVE?  >NOVICE DXCC


IF THE COUNTRY IS AN ISLAND, THEN THE WORD 'ISLAND' IS NOT IN THE NAME.
ALL COUNTRY NAMES ARE TAKEN FROM THE ARRL'S DXCC LIST.


GUANTANAMO BAY? >KG4
CORRECT, NICE GUESS.
YOU NOW HAVE 1 / 1 WORKED / CONFIRMED.


CANADA? >VE
CORRECT, NICE GUESS.
YOU NOW HAVE 2 / 2 WORKED / CONFIRMED.

TI? >COSTA RICA
CORRECT, NICE GUESS.
YOU NOW HAVE 3 / 3 WORKED / CONFIRMED.


FRANCE? >F
CORRECT, NICE GUESS.
YOU NOW HAVE 4 / 4 WORKED / CONFIRMED.


KP4? >PUERTO RICO
CORRECT, NICE GUESS.
YOU NOW HAVE 5 / 5 WORKED / CONFIRMED.


W? >UNITED STATES OF AMERICA
CORRECT, NICE GUESS.
YOU NOW HAVE 6 / 6 WORKED / CONFIRMED.


G? >ENGLAND
CORRECT, NICE GUESS.
YOU NOW HAVE 7 / 7 WORKED / CONFIRMED.


BELGIUM? >ON
CORRECT, NICE GUESS.
YOU NOW HAVE 8 / 8 WORKED / CONFIRMED.


XE? >MEXICO
CORRECT, NICE GUESS.
YOU NOW HAVE  9 /  9 WORKED / CONFIRMED.

DK? >GERMANY
WRONG, LID.  THERE IS A BAND OPENING.  TRY AGAIN.
DK?  FEDERAL REPUBLIC OF GERMANY
CORRECT, NICE GUESS.
YOU NOW HAVE 10 / 1C WORKED / CONFIRMED.


YV? >VENEZUELA
CORRECT, NICE GUESS.
YOU NOW HAVE 11 / 11 WORKED / CONFIRMED.


ITALY? >I
CORRECT, NICE GUESS.
YOU NOW HAVE 12 / 12 WORKED / CONFIRMED.


KZ5? >PUERTO RICO
WRONG, LID.  THERE IS A BAND OPENING.  TRY AGAIN.
KZ5? >NAVASSA
SURE YOU WOULDN'T RATHER TRY FOR WAS?  THE CORRECT ANSWER: CANAL ZONE
YOU NOW HAVE 13 / 12 WORKED / CONFIRMED.


COLUMBIA? >HK
CORRECT, NICE GUESS.
YOU NOW HAVE 14 / 13 WORKED / CONFIRMED.




AFTER CAREFUL SCRUTINIAZTION OF YOUR APPLICATION, THE WRITERS
OF THIS PROGRAM TAKE GREAT (NOT ALL THAT GREAT) PLEASURE
IN AWARDING YOU NOVICE DXCC.
YOU HAVE ACHIEVED A 92.85714 % WORKED / CONFIRMED RECORD.  FB!
YOU RETIRE WITH 14 / 13 WORKED / CONFIRMED.
SINCE YOU DID SO WELL, WHY HAVEN'T YOU MADE DXCC
FOR REAL?  NO, YOU CAN'T DO IT ON 2 METERS.
AND NOW FOR YOUR CERTIFICATE SUITABLE FOR FRAMING.......

_______________________________________________________________
          GARY TONCRE WA4FYZ AND CHRIS WEINER N2CR
              AWARD WA2GMO AN HONORARY COMPUTER
                         NOVICE DXCC

          DDDDDDDDD   XX      XX    CCCCCC      CCCCCC
          DDDDDDDDDD  XX      XX    CCCCCC      CCCCCC
          DD      DD    XX  XX    CC      CC  CC      CC
          DD      DD    XX  XX    CC      CC  CC      CC
          DD      DD      XX      CC          CC
          DD      DD      XX      CC          CC
          DD      DD      XX      CC          CC
          DD      DD      XX      CC          CC
          DD      DD      XX      CC          CC
          DD      DD      XX      CC          CC
          DD      DD    XX  XX    CC      CC  CC      CC
          DD      DD    XX  XX    CC      CC  CC      CC
          DDDDDDDDDD  XX      XX    CCCCCC      CCCCCC
          DDDDDDDDD   XX      XX    CCCCCC      CCCCCC
_______________________________________________________________


73, WA2GMO
UNIVAC 1100 IS CLEAR AND QRT.
```

Fig. 2. Sample program run.

printed and the confirmed figure is compared to the 90% figure of the countries worked of your class. If they are equal, or if the confirmed figure is greater, a jump is made out of the loop at line 710 to line 760. Otherwise, the loop repeats.

Assuming that you answered wrong just once, line 580 sends you to line 480, which is printed. T is incremented by one and you go back to line 550. If you goof again, line 590 sends you to line 490, which is printed; L=2, so line 610 is skipped and the answer is printed via line 620. Line 630 increments only your worked tally. A jump is made to the print of your record in line 680, and the rest proceeds as noted above.

If you haven't jumped out of the loop by the time you have gone through it N times, you haven't made 90% correct. In that case, the program goes to line 850 by way of 750 and ends at 9999. If you did win, the program goes through lines 800 to 840 and into the certificate subroutine. The program then returns to line 850 and ends at 9999.

### Modifications

This program was written on a Univac 1100 at the University of Miami. It should run as is on most large college and high school computers. If you want to run it on your micro, some changes might have to be made in the interests of conserving memory. You can eliminate lines 10 to 260, but, if you eliminate H$ in line 40, it won't be there to print your name or call on the certificate in the subroutine. You could also decide on just one class and eliminate everything up to line 450, except for giving N some value equal to the number of countries in your list. You could also eliminate the subroutine, but the certificate is nice, especially if you can get a hard copy of it. Of course, you can change the data to any countries or prefixes that you want, except those beginning with a number such as 5Z4—variables like those won't be accepted by the computer. If you don't want to alternate country-prefix-country, you can set up the data to print either the country or the prefix alone as the question. You can also make the game easier to win by changing the winning percentage on line 700 and also the print statement on line 230.

One of the nicest features of the program is that, by changing the data statements, you can adapt DXCC into a quiz, such as naming the capitals of the states. Just rewrite the data lines to read state-capital-state-capital and so on. The number of different quizzes that can be derived from this format is endless.

Note that our Univac accepts line 1030, the command "page." This allows our printer to print the certificate on a separate page. You might have to make a loop of print statements if you want this feature but lack the page command.

### Conclusions

We have spent many happy hours writing and playing DXCC. If you really want to get into it, try randomizing each class and making a large data list. We hope you enjoy DXCC, and, if you come up with any more modifications, send us a list of your version. We would like to see what you're doing. ■

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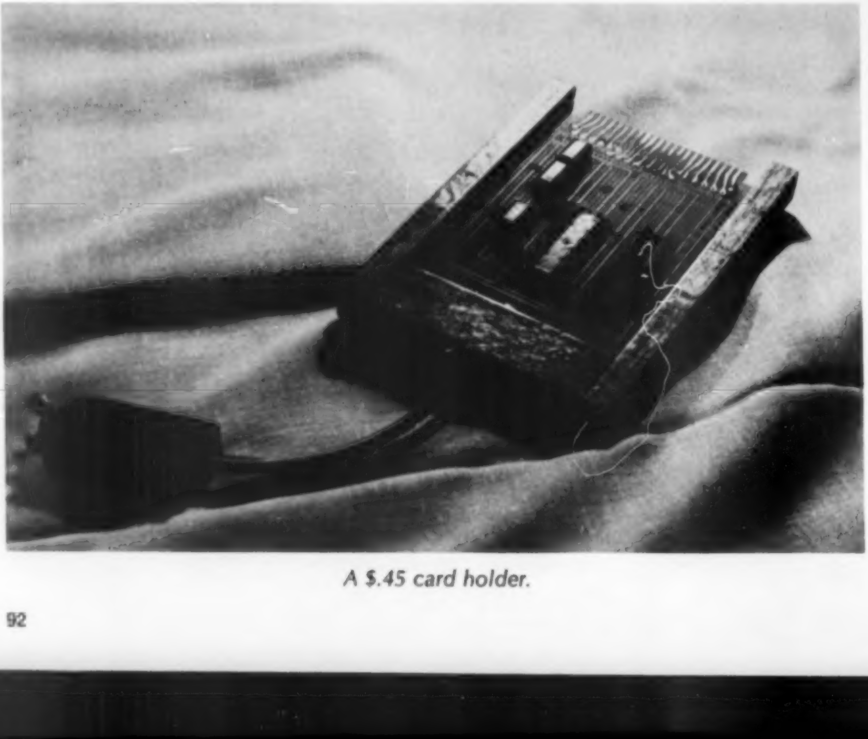
If you are still chasing PC cards across your workbench, you may be interested in a cheap card holder for PC boards. I was bitten by the computer bug this last winter and decided to build a system from scratch, using MSI and LSI chips and standard 44-pin prototyping boards. After evaluating a number of CPU chips and "one-board" systems, I decided to build a system based on the *Popular Electronics* ELF.

My goals were: to learn as much as possible, to keep the project within my limited budget, and to end up with an expandable system. The ELF was less than $100, and I felt it would be easy to expand with other hand-wired boards. I didn't feel competent to make my own PC boards, so I chose the prototype board and wiring-pencil method.

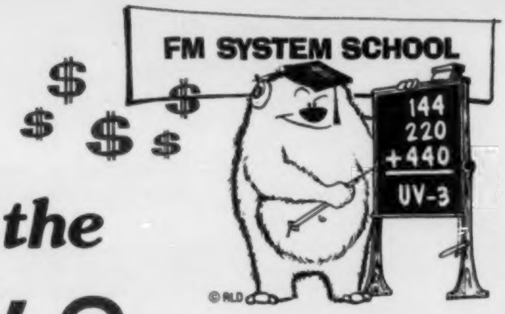
After collecting the necessary parts and designing a layout, my first problem was holding the PC board so that I could use a wiring pencil in one hand and a soldering iron in the other. My first thought was to locate a professional card holder and vise (such as the PANA-VISE), but it came down to a choice between using my limited cash for expensive equipment or buying computer hardware. I chose the latter, electing to solve the card-holding problem with my junk box and some leftover ingenuity.


A $.45 card holder.

After making sketches of my idea (Fig. 1), the next task was to collect parts. Rummaging among my bits of this and that stored in the garage, I spotted a hardwood stave from a shipping crate (2" x ¾" x 18") and a short length of threaded rod (¼" x 12"). In one coffee can I found five 1½" screws left over from a curtain-hanging project (I used molybolts after the curtain fell down), and in another coffee can were five washers and two wing nuts from a TV antenna that blew down long ago. It pays never to throw anything away!

That left me with some T-nuts to pick up at the local hardware (a package of five for 45¢). With this collection of bits and pieces, I hoped to make a PC card holder for a standard prototype board (4" x 6" or 4" x 9"). The size of the holder can be selected to suit your own needs. The small Radio Shack boards will fit if they are slipped in sideways.

To build the holder, I cut two pieces of hardwood



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(½" x ¾" x 8") and then put a 1/16" kerf down the length of each piece. This kerf was to hold the card once the wooden fingers were securely fastened to the buttblock with the four 1½" screws. I cut the 1½" x ¾" x 4-3/8" buttblock from the remaining hardwood and beveled one end. The bevel allows adjustable tension for one finger, permitting a snug fit on a variety of similar-sized cards. (I find small variations in different manufacturers' cards.)

Before fastening the fingers, I drilled a 5/16" hole in the center of the block and two pilot holes for the screws at each end. Next, I turned the buttblock up so the narrow side faced me and drove a T-nut into the 5/16" hole.

I then selected a 2" x ¾" x 2" section of the remaining hardwood, drilled a 5/16" hole through the center, and drove a T-nut into the hole. I now had two blocks with T-nuts.

Next, I fastened the fingers on the 2" x 4-3/8" block, one to each end. I found it advisable to predrill the screw holes in both the buttblock and the fingers. I drilled the finger holes so they would just fit over the screws. This made the buttblock holes snug enough to keep a good grip on the screws.

I assembled the holder by threading a wing nut about three inches onto one end of the rod, with the wings toward the center. Then I put a washer on the rod and then threaded on the card holder. I then threaded the remaining block on the rod with the T-nut facing the wing nut. Twisting it until the end protruded below the end of the block, I slipped on a washer and a wing nut.

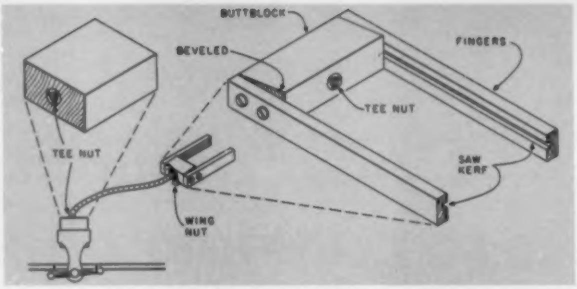
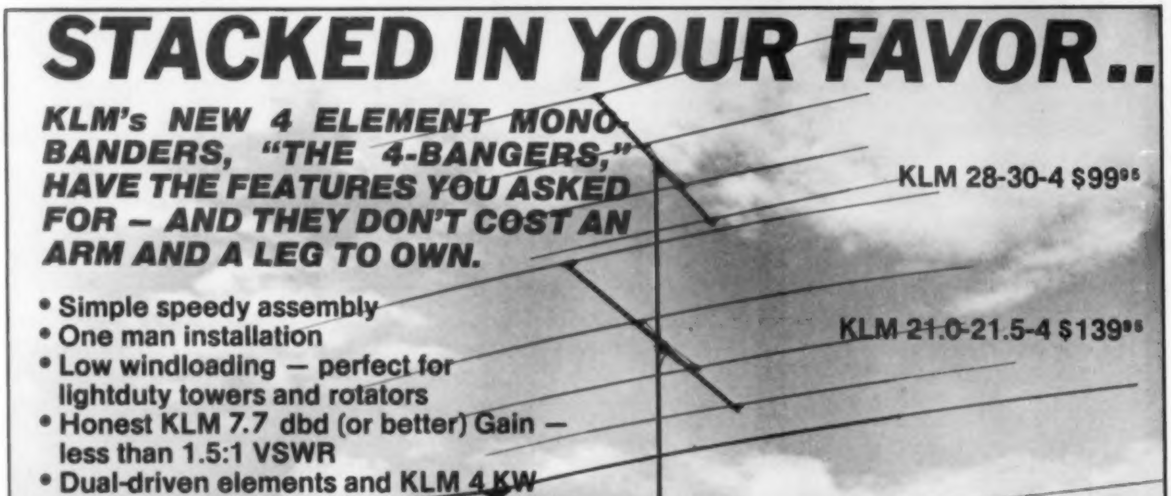


*Fig. 1.*

At this point I put the bottom block in the vise and bent the rod approximately 70°. In this position I can swing the holder in an arc or set it in position by tightening the wing nut at the bottom of the 2" x 2" block. I can position the holder at any 360° position on the end of the rod by tightening the wing nut behind the buttblock.

A coat of varnish finished the job. A PC card holder for less than 45¢! That is not counting the threaded rod (about $1.00) and the vise—which every hobbyist should have on hand.

In using the "cheap card holder," I find it useful to place a small mirror on the workbench under the PC card so that it is easy to see if wires pushed through from the other side are positioned correctly. It is not difficult, however, to flip the holder over to check wire position and flip it back again. I hope you find this as useful a tool as I do. ■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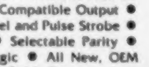

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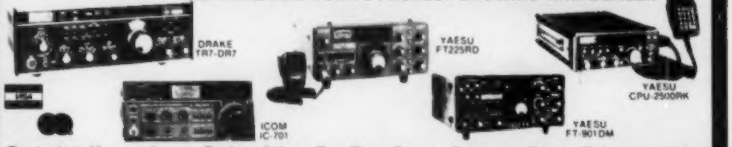

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# User Report: the IC-245

## —good things come in small packages

---

**Only two reservations.**

---

*R. Stanley Dicks W8YA*
*Box 331, RD2*
*Triadelphia WV 26059*

As many amateurs now are doing, I recently decided to upgrade from a crystal-controlled two-meter rig to a synthesized transceiver. I wanted an all-mode rig, but one which also was compact enough to use on FM from my small foreign car. After surveying the current market, I decided to try the Icom IC-245 with sideband adapter, and I definitely have not been disappointed! The compactness of the rig is truly amazing: It contains a fully-synthesized two-meter FM transceiver, a digital display, and a sideband/CW adapter, all in a box not much bigger than most two-meter FM rigs alone. Crammed into this box are 47 transistors, 8 FETs, 24 ICs, and 61 diodes, and one heckuva two-meter rig!

The 245 is fully synthesized from 144 to 148 MHz. From 146 to 148 MHz, it tunes in 5-kHz steps, and from 144 to 146 MHz in 100-Hz steps. There is, however, a button which allows one to tune in 5-kHz steps below 146 MHz, making sweeps of the band more rapid. Tuning is accomplished with a single large knob, eliminating the two or three switches and knobs which often must be turned on other synthesized rigs. The knob has a solid feel and has a click-stop mechanism so that it clicks and holds firm at each increment. This prevents possible drift due to jostling in the mobile, and also allows for tuning in heavy traffic without having to look at the rig. If one is on .76, for example, one can go to .79 simply by counting six clicks on the dial (at 5 kHz each).

ICOM IC-245
FM
CW
SSB

*This is the Icom IC-245.*

The rig comes with a quick-tuning adapter knob which easily can be slid onto the main knob, allowing rapid tuning across the band—especially on SSB. The digital display is large and easily readable, with four digits (146.52 reads out as 6.520), and an automatic dimmer so that the digits are dimmed in a dark environment (in the car at night) and bright in high ambient light. They shine brightly enough to read in all but very strong, direct sunlight. The meter indicates relative power on transmit and signal strength in receive.

The unit has an ingenious dual vfo system, also in use in Icom's 701 and 711, which allows almost total versatility in setting up offset frequencies. Under normal circumstances, one lines up the vfos 600 kHz apart, and they then track together for the routine repeater split. However, it is possible to program any split desired from 5 kHz to 955 kHz. The in-

# Flukemeter II.

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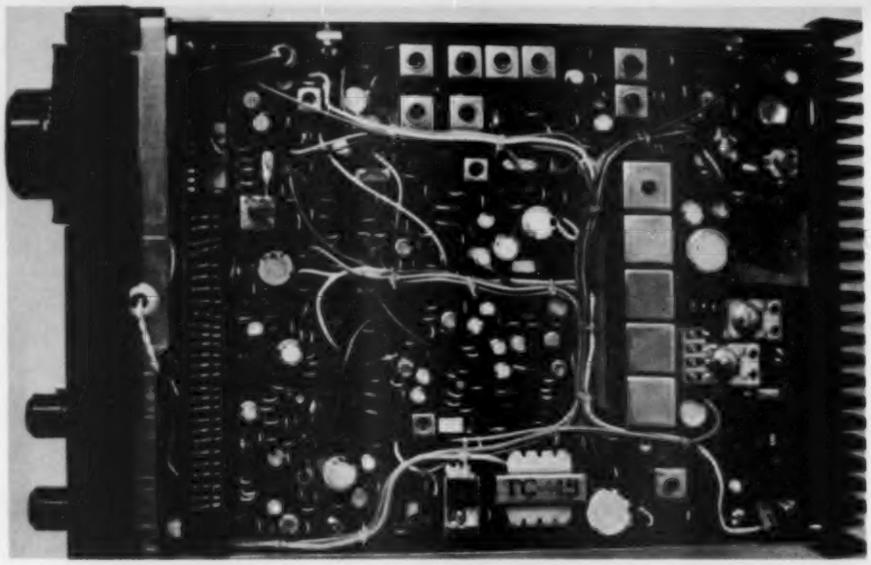

*A bottom view of the IC-245 shows the five connected cans containing the helical resonators which are responsible for the rig's excellent selectivity. The final transistor is in back.*

struction manual says that the unit has an automatic reverse circuit so that when tuning from 146 to 147 MHz, the 600-kHz split will automatically reverse, making it unnecessary to throw a switch to reverse transmit/receive frequencies above 147 MHz. A note accompanying the manual, however, states that, "due to customer requests," this automatic reversal system has been defeated by the addition of a single shorting wire. The note says that the wire must not be removed while the rig is in warranty. As soon as my warranty expires, I intend to remove the wire and see what happens; if the reversal system functions, it would make repeater access possible anywhere from 146 to 148 MHz without the necessity of throwing a single switch. Nifty?

The 245 runs 10 Watts on FM (true FM) and CW and 10 Watts PEP on upper sideband. Local stations report that the audio is crisp and clean on both FM and SSB, and that the CW note is excellent, with no chirping or clicking. They also report that carrier suppression is excellent; even when I am over S9, no one can hear any carrier at all.

The receiver section of the rig has the quality for which Icom has become renowned. Even in the presence of strong local signals, I have never heard any cross modulation or front-end overload. The audio sounds sharp for a two-meter rig, and a rear panel jack allows plug-in of an external speaker. The receiver seems to be quite sensitive on both SSB and FM. An FM signal of S1 will be full-quieting, and sideband signals are regularly copied which are out of range of the rig's 10-Watt transmitter. In fact, the receiver's sensitivity causes some frustration; I hear many stations I can't reach with only 10 Watts!

On FM, the 245 has a conventional double-conversion system with i-f stages at 10.7 MHz and 455 kHz, and on SSB/CW it has a single-conversion i-f at 10.7 MHz. Sensitivity is rated at 0.5 uV for a 10-dB (S+N)/N ratio on SSB/CW, and 0.6 uV for 20 dB of quieting on FM. If anything, the rig appears to be more sensitive than its ratings. The noise blanker for SSB/CW reception is quite effective at cancelling the occasional hash-type noises I have tried it on, and the rig is considerably more impervious to auto ignition noise than was my previous rig. No matter what I did to try to suppress ignition noise with the old rig, I had about S4 QRN; with the 245, the ignition noise is barely discernible. The receiver has a switch to select a slow agc rate for SSB reception, and the result is SSB which sounds as smooth as low-band SSB on my Drake receiver.

One can cite features and specifications all day, but the proof, as they say, is in the punch. The 245 is a delightful rig to own and operate. It is compact and therefore easily transferred from auto to house and back. Recently, I stuck it in my suitcase along with a small 12-volt supply and a whip antenna and took it on a business trip. Try that with other multi-mode rigs! Two-meter SSB operation from the 14th floor of a hotel is fun!

At home, with an 11-element, vertically-polarized beam at 70 feet, I can hear literally hundreds of repeaters on the synthesized rig and can regularly call into machines as far out as 150 miles. This is one of the real joys in store for the crystal-controlled operator who changes to synthesization; the number of accessible repeaters is staggering. The vertically-polarized beam doesn't do well on SSB and CW where most other stations are using horizontal antennas, but even with cross-polarization, the Icom's 10 Watts and sensitive receiver provide regular contacts out to about 100 miles. The 245 gives one full flexibility on two meters: FM work on any repeater or simplex frequency, satellite work, weak signal CW and SSB DXing, mobile and portable work, and so on.

I can cite only two reservations about the 245. First, it operates only USB, and thus cannot be used for mode J OSCAR work on SSB; maybe Icom will come out with an LSB filter. Second, the photosensitive cell which controls the automatic LED readout dimmer is located right beside the tuning knob. This means that when the operator reaches up to tune the knob, often he blocks light from the cell, causing the readout to dim. It is only a minor nuisance, and one soon learns to move the hand slightly when tuning so that this doesn't happen.

These reservations are negligible when compared to the flexibility and performance which such a small package provides. I can hardly wait to get a horizontal beam up and a small linear amp to tack on to the rig, and I am working on OSCAR antennas now. See you on 144.200! ■

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# The History of Ham Radio

## —part VIII

### The early '20s.

**Reprinted from QCC News, a publication of the Chicago Area Chapter of the QCWA.**

The evolution of radio before, and to a great extent during, the 1918 war year was for the most part in the hands of radio amateurs and the experimenters. The development of the vacuum tube and its utilization required much time for laboratory research. The quenched-gap and crystal detector were still very much in use. Considerable effort was being put forth by commercial companies together with government engineers, notably the Navy, to develop reliable means of generating undamped waves along semi-mechanical electrical lines. The culmination of these efforts was the Alexanderson alternator, providing high frequency energy with power up to 200 kilowatts to satisfy navigational and overseas communication demands.

Armstrong's Super-Regenerative Receiving Set
A detailed description with hookup diagrams and values prepared by the Radio Department, Newark Sunday Call, 204 Market, Newark, N. J.

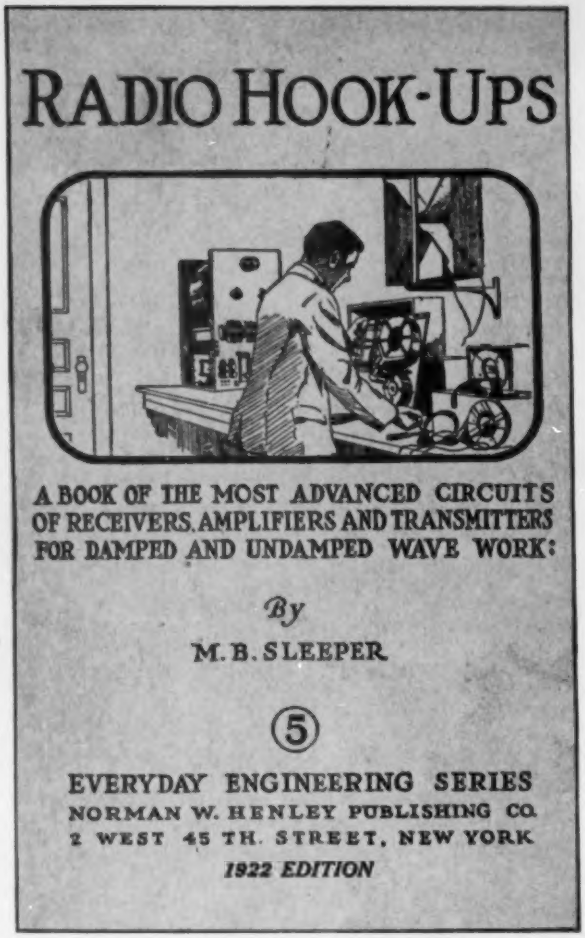
Following the evolution of radio art, two major patent-issuing corporations emerged in America, undertaking research toward larger and better vacuum tubes to replace the quenched-gap and the alternator. They were Radio Corporation of America, a group consisting of General Electric Company, Westinghouse Electric and Manufacturing Company, and American Telephone and Telegraph Company, which pooled patent licenses, and then Hazeltine Corporation, an independent licensing holder. This was a time when many patent applications were flooding the patent office covering circuit designs, and many component parts were entering into the assembly of radio receivers and transmitters. The two companies acted initially as holders of patent rights and issued licenses. Many individuals and small organizations, doing private research, were filing patent applications on hundreds of ideas pertaining to radio, thus leaving the budding industry wide open to massive confusion. The license holders tried to meet this avalanche of new developments by issuing warnings to developers, inventors, and all those who were active in the field, including those who purchased radio parts from dealers and jobbers. The warnings read, "the assembly of a receiver is only for your own private, experimental use, which includes broadcast reception of music and entertainment, not for broadcast transmission and NOT FOR SALE." In other words, licenses had to be obtained first by dealers or jobbers, manufacturers, or assemblers to go into business. With such regulations, back-door trading became commonplace, and many instruments found outlets designed to circumvent the restrictions.

It was to be expected that to satisfy the demand of the listening public, there would be concerns engaged in building and assembling receivers. During this period, it was not possible to standardize any specific design because of the extremely high rate of turnovers and obsolescence. The radio amateur was busily building and assembling sets for his friends and neighbors, who reaped the benefits of his expertise in wireless.

The market mushroomed with the proliferation of broadcast transmitters throughout the United States and the rapidly increasing availability of radio receivers. Improvements in quality and reliability also contributed to lowered costs. Vacuum tubes were produced by the thousands, gradually improving their function but remaining far from being a uniform product. The UV-200 detector and the UV-201 amplifier were the mainstays. All others were either experimental or leftovers from previous designs.

The year 1921 saw a rapid growth of broadcast radio service. Electric manufacturing companies, universities, newspapers, and many individuals obtained permission from the Department of Commerce to become broadcasters. Radio amateurs had permission to transmit news, music, and items of interest over their stations. Broadcasting received the attention and guidance of various government departments. Interest in radio was universal.

This rapid expansion also had its reverse effects. Interest waned when disturbances occurred. The reason—general news and entertaining music was relegated to one wavelength, i.e., 360 meters. Official government stations broadcasting information, weather, and market news were on a wavelength of 485 meters. Not all stations held to these wave assignments accurately. Deviations gave some stations advantages over others. There was not enough room for all to communicate without excessive crossovers. The 1921-1922 receivers were not built to be selective or to avoid overlapping signals. Unless stations geographically close together decided by agreement to broadcast at different times of the day or were located some distances apart, the listener was denied satisfactory reception.


RADIO HOOK-UPS

A BOOK OF THE MOST ADVANCED CIRCUITS
OF RECEIVERS, AMPLIFIERS AND TRANSMITTERS
FOR DAMPED AND UNDAMPED WAVE WORK:

By
M. B. SLEEPER

⑤

EVERYDAY ENGINEERING SERIES
NORMAN W. HENLEY PUBLISHING CO.
2 WEST 45 TH. STREET, NEW YORK
*1922 EDITION*

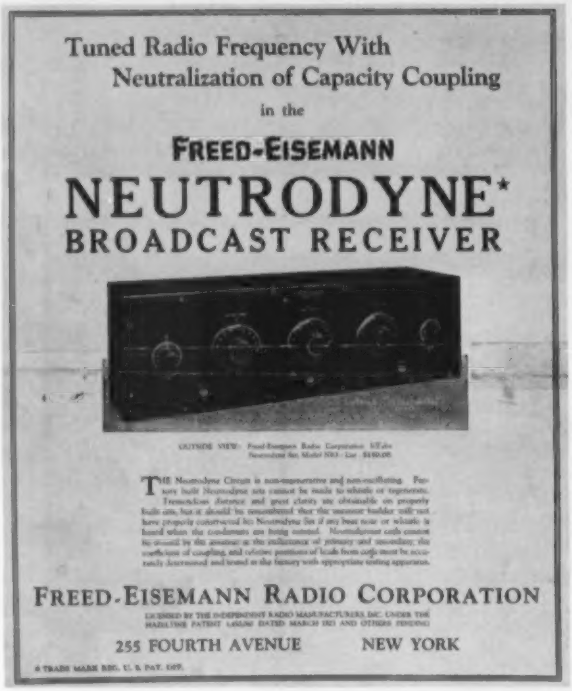
This troublesome problem of interference became so acute that in February, 1922, the Department of Commerce drew up plans which rearranged wavelengths to the broadcaster and to other services as follows:

Public Broadcasting, signifying broadcasting from universities, public institutions, and stations licensed for the purpose of dissemination of information and for educational services, was assigned 485 to 495 meters.

Private Broadcasting, signifying broadcasting by a newspaper, private or public organization, or person licensed for that purpose, including amateurs, was assigned 100 to 150 meters and 285 to 485 meters.

Other wavelengths were intended for commercial ship to shore and overseas communication.

General broadcasting stations were on wavelengths sufficiently different so as not to be heard when a receiving set was tuned to another station. This was to be determined by the broadcaster himself, using his own equipment. Amateurs were supposed to operate mostly late at night, using wavelengths below 275 meters. The early receivers had practically no selectivity. They were



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very broad tuning, unstable, and consumed a great deal of energy, operating from dry cells and storage batteries. Radio receivers which could be operated from the standard 115-volt circuit had not yet arrived.

In 1914, Major Edwin H. Armstrong invented a radio receiver circuit known as the regenerative circuit. He obtained a patent from the government on October 6, 1914. This circuit described the use of the vacuum tube in a detector-oscillator combination. Vacuum tubes were at that time only in the experimental stage, crudely constructed, unreliable, and not readily available. Consequently, very little development took place before 1917 to test the unique application of the Armstrong circuit wireless signal reception.

The regenerative principle in the circuit is most simply described by stating that when energy is applied at the input terminals of a circuit connected to a vacuum tube in oscillation, the circuit presents either a more negative or a more positive reaction. The objectionable feature of a regenerative circuit was self-oscillation, which was uncontrollable in the hands of the average user. The whistles and howls coming from the loudspeaker or headphones were shocking and became unbearable.

Under such unstable conditions, the radio amateur came up with novel innovations, especially when tuning to continuous wave signals. When using his audiotron tube or his Marconi, De Forest, Donle, or Connecticut "vacuum bottle" for that critical adjustment to bring the reception under control, the presence of a magnet in the proper vicinity of the tube, held at certain angles to the bulb, would increase the intensity of the signal. Close adjusment of the magnet gave excellent results.

Early in August, 1919, the De Forest Company announced one of the first receivers for the monitoring of phone and/or continuous wave signals. It covered 160 to 450 meters and was designated the three-coil ultra-audion. It was designed as a shortwave regenerative instrument composed of a series of individually-wired sections and was hooked up as a composite assembly. Hardly a receiver for use by the general public.

Receivers could be assembled following the circuits illustrated in handbooks like the one issued by M. B. Sleeper entitled *Radio Hook-Ups*. The illustrations basically used a coil or two, a tuning condenser, and either a crystal or vacuum tube detector plus a pair of headphones. The tubes available were leftovers, designed during the war by French, German, English, and American laboratories.

They were not very reliable and rarely gave uniform results. It was not uncommon to find a backroom laboratory coming up with some exotic tube design. The intent was to try to improve such undesirable characteristics as excessive filament current drain, objectionable interelectrode capacitances, and short-lived filament emission.

The radio literature of the 1920s carried instructions on how to assemble receivers utilizing various types of coils (these included universal, honeycomb, unilateral, duolateral, bi- and multilattice), tuning condensers (of the straight line wavelength, straight line frequency, book-type design), variometers, and variocouplers tied to a vacuum tube or two in cascade.

In 1920, the radio amateur and the avid listener had available receivers manufactured under license. They were known as Grebe CR instruments. These receivers were not the type to place into the hands of the uninitiated. They were meant for the radio amateur and experimenter.

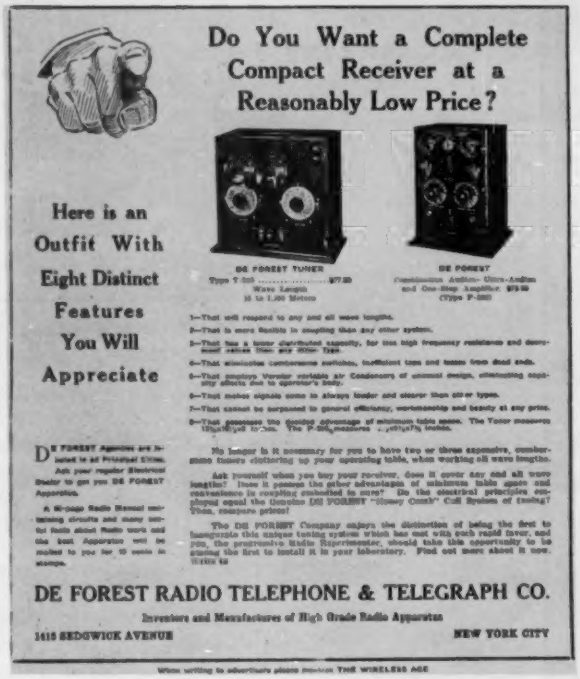
For shortwave reception, which included broadcast, the internal capacity of the tube proved a bar to any straightforward solution. Realizing that the vacuum tube was at the heart of the problem, Major Armstrong came up with a solution in the circuit principle named the heterodyne and superheterodyne. It is based on the mixing together of two frequencies in order to produce two frequencies which are equal to the sum and difference of the other two. In so doing, an intermediate frequency was produced which could be more effective and responsive to the characteristics of the available tube. The resultant amplification was a comparison of the voltage applied to a second detector in the circuit to that of the incoming terminal voltage.

A receiver built along these lines required a series of 6 to 8 tubes and gave excellent amplification. It required skilled manipulation of the controls, since adjustments had to be made at numerous positions to track the frequencies of the incoming signal. Sensitiveness of the superheterodyne receiver was proven by Paul Godley while at Androsen, Scotland, in December, 1920, when he logged numerous American stations during the transatlantic initial DX contest, related in part V of "The History of Ham Radio."

In analyzing the various circuit combinations of the heterodyne, it was found that the operation of the system proved a little too critical, especially since, to avoid interaction, individual tubes were required for detection and for rectification. As a result, tuning became more complicated. Engineers remarked that if some way could be found for tuning adjustments to be set and sealed in the laboratory by skilled engineers leaving relatively simple adjustments to the operator, the receiver would be the ideal.

The main difficulty which had to be overcome was the instability from the combination of high amplifications desired. The solution hinged on overcoming the generated oscillations when the number of tubes of the 1921-1922 vintage were hooked to one another in cascade. Much effort was expended in designing intertube transformers of air-core, special iron-core, special couplings, and windings, to balance the impedances from stage to stage. Instability was the problem, again depending on the tubes available.

Well known, in 1922, was a receiver called the neutrodyne. It was designed around a non-regenerative and non-oscillating configuration. When properly constructed and assembled, the one thing this circuit did not do was emit objectionable whistles. The neutrodyne relied on straightforward cascade amplification of the incoming signal. It started with one or two stages of radio frequency amplification, then detection and reinforcement with one, two, or even three stages of audio frequency amplification. It was a popular receiver in its day. The set suffered from an undue amount of internal noise, generated and amplified due to mismatched component parts, internal tube disturbances, and lack of sufficient tuning controls to balance out the inherent design faults.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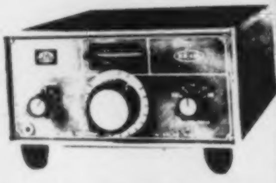

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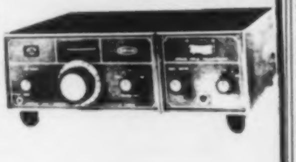

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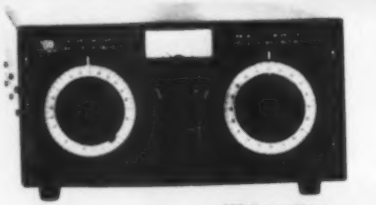

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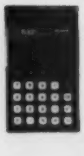

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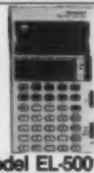

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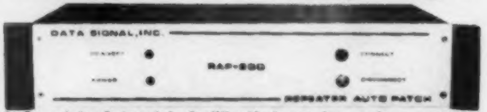

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Medford, MA 02155
(617) 395-8280
(800) 225-4428

**OPEN DAILY 9-9**
**SATURDAY 9-6**

PRODUCTS OF SOUND RESEARCH

## TELEX Lightweight Headphones

COMMUNICATIONS, INC.

**HFC-91**
Ultra-light underchin. Accoustic delay of 1 millisecond enhances intelligibility on CW or SSB. Low impedance 8-20 ohms. Shaped response – 100 - 3,000 Hz. 1.5 ounces

**Order by Catalog No. 18135-013 $9.90**

**HMC-2**
Featherweight – Underchin, rugged aluminum tone arms direct signals into the ear – great for contests. 1.2 ounces. 100 - 3,000 Hz. Low impedance 8-20 ohms

**Order by Catalog No. 18183-002 $15.50**

**HTC-2**
Lightest Dual driver headset. Choice of the pro's who must wear them for hours. 1.6 ounces. 100 - 3,000 Hz. Low impedance 8-20 ohms

**Order by Catalog No. 3775-000 $24.50**

COMFORT
PLUS

**PC-100 Headphone**
Full cushion comfort – performance and long life make these dynamic phones ideal for novice or extra. 50 - 12,000 Hz. Low impedance 8 - 200 ohms, weight 12 ounces

**Order by Catalog No. 63510-010**

**$16.95**

**Headphone Jack Box**
Ham Clubs, field day, contest operation. No more "jury rigs" for multiple headphones, six 1/4" phone jacks with individual volume controls. 4 foot cord with 1/4" phone plug.

**Order by Catalog No. 62753-000**

**$14.30**

## PROFESSIONAL HEADPHONES & HEADSETS

### BOOM MIC HEADSETS

For the ultimate in communications convenience and efficiency select a boom mic headset. Long-time favorites of professional communications, boom mic headsets allow more personal mobility while always keeping the mic properly positioned for fast, precise voice transmission. Boom microphones are completely adjustable to allow perfect positioning. And, boom mic headsets leave both hands free to perform other tasks.

All models are supplied with "close talking" microphones to limit ambient noise pick up and provide superior intelligibility. Each model has a convenient, inline push to talk switch, which can be wired for either push to talk relay control or mic circuit interrupt for voice operated transmitters. The switch may be used as a momentary push button or it can be locked in the down position. All models have tough, flexible, 8 foot cords which are stripped and tinned, unterminated. Communication grey with black trim.

| MODEL | C-610 | SWL-610 | C-1210 | C-1320 | CM-610 | CM-1210 | CM-1320 | CM-1320S |
|---|---|---|---|---|---|---|---|---|
| Headphone Sensitivity Ref. .0002 Dynes/cm² @ 1mW input, 1kHz | 103dB SPL<br>±5dB | 103dB SPL<br>±5dB | 103dB SPL<br>±3dB | 105dB SPL<br>±5dB | 103dB SPL<br>±5dB | 103dB SPL<br>±3dB | 105dB SPL<br>±5dB | 105dB SPL<br>±5dB |
| Headphone Impedance | 3.2<br>20 ohms | 2000 ohms | 3.2<br>20 ohms | 3.2<br>20 ohms | 3.2<br>20 ohms | 3.2<br>20 ohms | 3.2<br>20 ohms | 3.2<br>20 ohms |
| Microphone Frequency Response | | | | | 50<br>8000 Hz | 50<br>8000 Hz | 50<br>8000 Hz | 50<br>8000 Hz |
| Microphone Impedance | | | | | High | High | High | High |
| Microphone Sensitivity Below 1 volt/microbar at 1kHz | | | | | 51dB<br>±5dB | -51dB<br>±5dB | -51dB<br>±5dB | 51dB<br>±5dB |
| Price: | $10.45 | $12.25 | $29.70 | $41.80 | $47.20 | $62.75 | $75.25 | $59.95 |

**Model C610 (SWL 610)**

**Model C 1320**

**Model CM 610**

**Model CM 1210**

**Model C 1210**

**Model CM 1320**

**Model CM 1320S**

---

Novice Crystals (Specify Band Only)

## BOMAR *Crystal Company*

**TWO METERS**

**CRYSTALS IN STOCK**

**Motorola HT 220 Crystals In Stock!**

Standard ● Icom ● Heathkit ● Ken ● Clegg ● Regency ● Wilson ● VHF Eng ● Drake ● And Others!

**LIFETIME GUARANTEE!**
**NOW ONLY $9.00 A PAIR!**

| Make/Model | Xmit Freq. | Rec. Freq. |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

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## HI-Q BALUN

- For dipoles, yagis, inverted vees, doublets & quads
- For full legal power & more
- Puts power in antenna
- Broadbanded 3-40Mhz.
- Small, light, weather-proof
- 1:1 impedance ratio
- Replaces center insulator
- Helps eliminate TVI
- Fully Guaranteed

**$9.95**

**Van Gorden Engineering** U.S.A.

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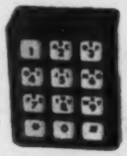
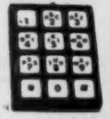
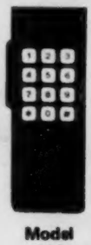


**Model 300**



**Model 210**

**Model 221**



**Model 220**

**CES Touch Tone Pads**
- ● Model 300 – acoustic coupling. $49.95
- ● Model 210 – for mounting on walkies or hand-helds. $39.95
- ● Model 220 – CES can now offer you a TOUCH TONE back for Standard Communications hand-held radios. This is the complete back assembly with the TOUCH TONE encoder mounted and ready to plug into the private channel connector. Also included is a LED tone generator indicator and an external tone deviation adjustment. $59.95
- ● Model 215 (miniature version of 210) – $39.95
- ● Model 221 long – $59.95 } Motorola HT220 Back with Pad Mounted
- ● Model 221 short – $59.95 }

---

## THE HAM-KEY
### NOW 5 MODELS

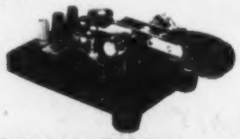
NEW AND IMPROVED
HAM KEYER

**Model HK-5A**
**Electronic Keyer – $69.95**

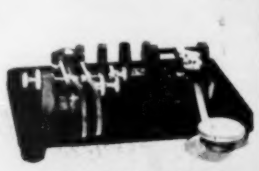
● New Cabinet color-keyed to match most modern radio equipment ● Iambic circuit for squeeze keying ● Self-completing dots & dashes ● Dot memory ● Battery operated with provision for external power ● Built-in side-tone monitor ● Grid block or direct keying ● Speed, volume, tone & weight controls all mounted on front panel. ● For use with external paddle, such as HK-1 or HK-4 ● Can be used as Code practice oscillator with straight-key, such as HK-3

**Model HK-2 $19.95**
● Same as HK-1, less base for those who wish to incorporate in their own Keyer.

**Model HK-3 $16.95**
- Deluxe straight key.
- Heavy base, no need to attach to desk.
- Velvet smooth action.



**Model HK-1 $29.95**
- Dual lever squeeze paddle.
- Use with HK-5 or any electronic keyer.
- Heavy base with non-slip rubber feet.
- Paddles reversible for wide or close finger spacing.



**Model HK-4 $44.95**
- Combination on HK-1 & HK-3 on same base.

# ATB-34

## 4 ELEMENT BEAM 10-15-20 METERS

Cushcraft engineers have incorporated more than 30 years of design experience into the best 3 band HF beam available today. **ATB-34** has superb performance with three active elements on each band, the convenience of easy assembly and modest dimensions. Value through heavy duty all aluminum construction and a price complete with 1-1 balun.

**SPECIFICATIONS**

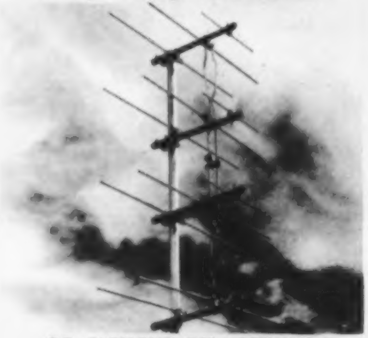
FORWARD GAIN - EXCELLENT
F/B RATIO - 30 dB
VSWR - 1.5-1
POWER HANDLING - 2000 WATTS PEP
BOOM LENGTH/DIA - 18' x 2 1/8
LONGEST ELEMENT - 32.8
TURNING RADIUS - 18.9
WIND SFC - 5.4 Sq Ft
WEIGHT - 42 Lbs
WIND SURVIVAL - 90 MPH

**UPS SHIPPABLE**

**$259.59 complete**

**ENJOY A NEW WORLD OF DX COMMUNICATIONS WITH ATB-34**

# VHF - UHF DX-ARRAYS
## 144, 220, 430 mhz



## 20 ELEMENT DX - ARRAYS
### 20 ELEMENT SPECIFICATIONS

Forward Gain ------ 14.2 db
F/B Ratio ----------- 20 db
Fwd. Lobe at 1/2 Pwr. Point
horizontal ---------- 48°
vertical ------------ 26°
Impedance --------- 52 ohms
VSWR at Frequency ----1 - 1
Bandwidth W/VSWR
Less than 2 - 1 ---- 4 mhz
Power Handling -- 2 KW PEP

| | 144 Mhz | 220 Mhz | 432 Mhz |
|---|---|---|---|
| Height | 118" | 78" | 42" |
| Width x Depth | 75" x 30" | 53" x 20" | 29" x 11" |
| Turning Radius | 46" | 32" | 18" |
| Maximum Mast Dia. | 1 1/2" | 1 1/2" | 1 1/2" |
| Net Weight Lbs. | 6 | 7 | 6 |

Vertical support mast not supplied

| 2 Meter DX-120 | 1¼ Meter DX-220 | ¾ Meter DX-420 |
|---|---|---|
| Am. Net $47.95 | $42.95 | $36.95 |

## 40 ELEMENT DX - ARRAYS
### 40 ELEMENT SPECIFICATIONS

Forward Gain -------- 17 db
F/B Ratio ----------- 20 db
Fwd. Lobe at 1/2 Pwr. Point
horizontal ---------- 32°
vertical ------------ 26
Impedance --------- 52 ohms
VSWR at Frequency ----1 - 1
Bandwidth W/VSWR
Less than 2 - 1 ---- 4 mhz
Power Handling -- 2 KW PEP

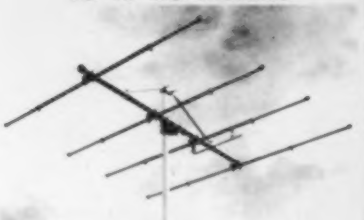
| | 144 Mhz | 220 Mhz | 432 Mhz |
|---|---|---|---|
| Height | 118" | 78" | 42" |
| Width x Depth | 192" x 30" | 132" x 20" | 72" x 11" |
| Turning Radius | 101" | 65" | 38" |
| Maximum Mast Dia. | 2 1/2" | 2 1/2" | 2 1/2" |
| Net Weight Lbs. | 32 | 22 | 12 |
| Wind Rating | 90 mph | 90 mph | 90 mph |
| Stack Kit No. | DXK-140 | DXK-240 | DXK-440 |
| Amateur Net | $ 65.95 | $59.95 | $45.95 |

## 80 ELEMENT DX - ARRAYS
### 80 ELEMENT SPECIFICATIONS

Forward Gain -------- 20 db
F/B Ratio ----------- 20 db
Fwd. Lobe at 1/2 Pwr. Point
horizontal ---------- 32°
vertical ------------ 12°
Impedance --------- 52 ohms
VSWR at Frequency ----1 - 1
Bandwidth W/VSWR
Less than 2 - 1 --- 4 mhz
Power Handling -- 2 KW PEP

| | 144 Mhz | 220 Mhz | 432 Mhz |
|---|---|---|---|
| Height | 275" | 182" | 97" |
| Width x Depth | 192" x 30" | 132" x 20" | 72" x 11" |
| Turning Radius | 101" | 65" | 38" |
| Maximum Mast Dia. | 2 1/2" | 2 1/2" | 2 1/2" |
| Wind Rating | 90 mph | 90 mph | 90 mph |
| Net Weight Lbs. | 64 | 43 | 24 |
| Stack Kit No. | DXK-160 | DXK-280 | DXK-480 |
| Amateur Net | $119.95 | $99.95 | $89.95 |

# HF MONOBEAMS
## 10 15 20 METERS



## 10 METERS

**3 ELEMENT BEAM**: You can have an outstanding signal using this compact three element beam. It is easily mounted on a lightweight rotator and takes only a limited amount of space.
Model No. A28-3—$79.95

**4 ELEMENT BEAM**: A real DX'ers beam for the active ham who wants a top signal on 10 meters. Mount on a good ham rotator. Model No. A28-4—$89.95

| SPECIFICATIONS | A28-3 | A28-4 |
|---|---|---|
| BOOM | 1 1/2" x 10' | 1 5/8" x 18' |
| LONGEST ELEMENT | 17' 6" | 18' |
| ELEMENT DIAMETER | 7/8" - 1/2" | 7/8" - 3/4" |
| TURNING RADIUS | 10' | 14' 3" |
| FORWARD GAIN | 8 db | 10 db |
| FRONT TO BACK | 22 db | 25 db |
| SWR @ FREQUENCY | 1 to 1 | 1 to 1 |
| WEIGHT | 11 lbs. | 21 lbs. |

## 15 METERS

**3 ELEMENT BEAM**: A high quality beam which can be mounted on a mast with other antennas. A heavy duty TV rotator will handle it.
Model No. A21-3—$99.95

**4 ELEMENT BEAM**: For the 15 meter enthusiast: this beam will give real DX performance. When mounted on a good ham rotator it will withstand the most adverse weather conditions.
Model No. A21-4—$129.95

| SPECIFICATIONS | A21-3 | A21-4 |
|---|---|---|
| BOOM | 1 5/8" x 12' | 1 3/4" x 21' 6" |
| LONGEST ELEMENT | 22' 10" | 22' 10" |
| ELEMENT DIAMETER | 7/8" - 3/4" | 7/8" - 3/4" |
| TURNING RADIUS | 13' - 3" | 15' - 8" |
| FORWARD GAIN | 8 db | 10 db |
| FRONT TO BACK | 22 db | 25 db |
| SWR @ FREQUENCY | 1 to 1 | 1 to 1 |
| WEIGHT | 16 lbs. | 32 lbs. |

## 20 METERS

**2 ELEMENT BEAM**: Full size beam performance for the active 20 meter ham with limited space and budget.
Model No. A14-2—$119.95

**3 ELEMENT BEAM**: A real DX-er's beam with full .15 wavelength element spacing. The heavy duty construction gives years of trouble-free service. Model No. A14-3 $159.95

| SPECIFICATIONS | A14-2 | A14-3 |
|---|---|---|
| BOOM | 1 5/8" x 10' | 1 5/8" x 20' 6" |
| LONGEST ELEMENT | 35' 10" | 35' 10" |
| ELEMENT DIAMETER | 1 1/8" - 3/4" | 1 1/8" - 3/4" |
| TURNING RADIUS | 18' | 21' |
| FORWARD GAIN | 5 db | 8 db |
| F/B RATIO | 13 db | 22 db |
| SWR @ FREQUENCY | 1 to 1 | 1 to 1 |
| WEIGHT | 20 lbs. | 33 lbs. |

World Radio TV Handbook

# World Radio TV Handbook 1979

A Complete Directory of International Radio and Television

The most exhaustive and authoritative guide to broadcasting and television stations around the world today. **WORLD RADIO TV HANDBOOK 1979** is an indispensable manual for anyone with a working interest in radio and television. Features:

- Names and addresses of broadcast companies and stations by country
- Names and titles of leading officials and personnel
- Listing by frequency of shortwave stations around the world
- Program data including frequencies, wave lengths, transmitter power, call signs, times, announcements (in each language)

Plus, a special in-depth editorial section with professional articles, suggestions and tips—and much, much more. **WORLD RADIO TV HANDBOOK 1979**

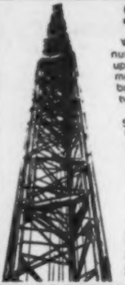
**$15.00**

## HF Verticals 10-80 Meters

● efficient top ring ● fiberglass trap forms ● enameled wire coils ● solid aluminum capacitors ● no tuning required ● full compression clamps ● omnidirectional coverage ● reinforced base ● mast or ground mounting ● pre-marked sections ● easy assembly ● superior quality.

**3 BAND** 20-15 meters/Model ATV-3 . . . . . . . . . . . . . . . $49.95
**4 BAND** 4·20·15·10 meters/ Model ATV-4 . . . . . . . . . . $89.95
**5 BAND** 80·40·20·15·10 meters /Model ATV-5 . . . . . . . . $109.95

cushcraft



# Speak up.

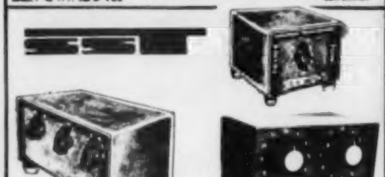
We know all about up. In fact, we're number one from the ground up when it comes to amateur communications towers. We've been building them for HAMS for more than two decades.

Whether you're thinking crank-up, guyed or free-standing, check with us first. We're Tri-Ex. Reliable, dependable.

When we say number one from the ground up, we're talking about towers like Tri-Ex's new "Big W" shown here. It's a free-standing crank-up with a height of 80-ft, providing good DX capability at low cost. Ideal for serious HAMS.

**Model W51**
**(51' Self-supporting)**
**$850.00**

Tri-Ex TOWER CORPORATION



## SST T-1 RANDOM WIRE ANTENNA TUNER

All band operation (160-10 meters) with any random length of wire. 200 watt output power capability — will work with virtually any transceiver. Ideal for portable or home operation. Great for apartments and hotel rooms — simply run a wire inside, out a window, or anyplace available. Toroid inductor for small size: 4-1/4" x 2-3/8" x 3". Built-in neon tune-up indicator. SO-239 connector. Attractive bronze finished enclosure. Only $29.95

## SST T-2 ULTRA TUNER

Tunes out SWR on any coax fed antenna as well as random wires. Works great on all bands (160-10 meters) with any transceiver running up to 200 watts power output.
Increases usable bandwidth of any antenna.
Tunes out SWR on mobile whips from inside your car.
Uses toroid inductor and specially made capacitors for small size: 5¼" x 2¼" x 2½." Rugged, yet compact. Attractive bronze finished enclosure. SO-239 coax connectors are used for transmitter input and coax fed antennas. Convenient binding posts are provided for random wire and ground connections. Only $49.95

## SST T-3 IMPEDANCE TRANSFORMER

Matches 52 ohm coax to the lower impedance of a mobile whip or vertical. 12 position switch with taps spread between 3 and 52 ohms. Broadband from 1-30 MHz. Will work with virtually any transceiver — 300 watt output power capability. SO-239 connectors. Toroid inductor for small size: 2-3/4" x 2" x 2-1/4." Attractive bronze finish. Only $19.95

# 6 METER BEAMS

## 3 - 5 - 6 - 10 ELEMENTS

Proven performance from rugged, full size, 6 meter beams. Element spacings and lengths have been carefully engineered to give best pattern, high forward gain, good front to back ratio and broad frequency response.

Booms are .058 wall and elements are 3/4" - 5/8" .049 wall seamless chrome finish aluminum tubing. The 3 and 5 element beams have 1 3/8" - 1 1/4" booms. The 6 and 10 element beams have 1 5/8" - 1 1/2" booms. All brackets are heavy gauge formed aluminum. Bright finish cad plated ubolts are adjustable for up to 1 5/8" mast on 3 and 5 element and 2" on 6 and 10 element beams. All models may be mounted for horizontal or vertical polarization.

New features include adjustable length elements, kilowatt Reddi Match and built-in coax fitting for direct 52 ohm feed. These beams are factory marked and supplied with instructions for quick assembly.

| Description | 3 element | 5 element | 6 element | 10 element |
|---|---|---|---|---|
| Model No. | A50 3 | A50 5 | A50 6 | A50 10 |
| Boom Lngth | 6' | 12' | 20' | 24' |
| Longest El. | 117" | 117" | 117" | 117" |
| Turn Radius | 6' | 7' 6" | 11' | 13' |
| Fwd. Gain | 7.5 dB | 9.5 dB | 11.5 dB | 13 dB |
| F/B Ratio | 20 dB | 24 dB | 26 dB | 28 dB |
| Weight | 7 lbs. | 11 lbs. | 18 lbs. | 25 lbs. |

### COAXIAL DUAL STACKING KITS

Double your effective radiated power by stacking 6 meter beams. Cush Craft coaxial stacking kits provide a simple and efficient method for realizing 3 db additional gain while maintaining the superior characteristics of our single beams. The stacking kits are complete with RG-59/U cable and preassembled fittings for direct 52 ohm feed.

| Model No. | For stacking: | Amateur Net |
|---|---|---|
| A535-SK | A50-3 or A50-5 | $17.95 |
| A561-SK | A50-6 or A50-10 | $19.95 |

new

**RINGO RANGER**
**for FM**

**4.5 dB* – 6 dB****
**Omnidirectional**
**GAIN**
**BASE STATION**
**ANTENNAS**
**FOR**
**MAXIMUM**
**PERFORMANCE**
**AND**
**VALUE**

Cush Craft has created another first by making the world's most popular 2 meter antenna twice as good. The new Ringo Ranger is developed from the basic AR-2 with three half waves in phase and a one eighth wave matching stub. Ringo Ranger gives an extremely low angle of radiation for better signal coverage. It is tunable over a broad frequency range and perfectly matched to 52 ohm coax.

**ARX-2, 137-160 MHz, 4 lbs., 112"**
**ARX-220, 220-225 MHz, 3 lbs., 75"**
**ARX-450, 435-450 MHz, 3 lbs., 39"**

* Reference ½ wave dipole.
** Reference ¼ wave whip used as gain standard by many manufacturers.

Work full quieting into more repeaters and extend the radius of your direct contacts with the new Ringo Ranger.

You can up date your present AR-2 Ringo with the simple addition of this extende. kit. The kit includes the phasing network and necessary element extensions. The only modifications required are easy to make saw slits in the top section of your antenna.

**ARX-2K CONVERSION KIT**

# 2 METER ANTENNAS FM

**A-FM RINGO** 3.75 dB Gain (reference ¼ wave whip). Half wave length antennas with direct dc ground, 52 ohm feed takes PL-259, low angle of radiation with 1-1 SWR. Factory preassembled and ready to install, 6 meter partly preassembled, all but 450 MHz take 1¼" mast. There are more Ringos in use than all other FM antennas combined.

| Model Number | AR-2 | AR-25 | AR-6 | AR-220 | AR-450 |
|---|---|---|---|---|---|
| Frequency MHz | 135-175 | 135-175 | 50-54 | 220-225 | 440-460 |
| Power—Hdlg. Watts | 100 | 500 | 100 | 100 | 250 |
| Wind area sq. ft. | .21' | .21' | .37' | .20' | .10' |

**B-4 POLE** Up to 9 dB Gain over a ½ wave dipole. Overall antenna length 147 MHz — 23' 220 MHz — 15', 435 MHz — 8', pattern 360° — 6 dB gain, 180° — 9 dB gain, 52 ohm feed takes PL 259 connector. Package includes 4 complete dipole assemblies on mounting booms, harness and all hardware. Vertical support mast not supplied.

AFM-4D 144 - 150 MHz, 1000 watts, wind area 2.56 sq. ft.
AFM-24D 220 - 225 MHz, 1000 watts, wind area 1.85 sq. ft.
AFM-44D 435 - 450 MHz, 1000 watts, wind area 1.13 sq. ft.

**D-POWER PACK** The big signal (22 element array) for 2 meter FM, uses two A147-11 yagis with a horizontal mounting boom, coaxial harness and all hardware. Forward gain 16 dB, F/B ratio 24 dB, ½ power beamwidth 42°, dimensions 144" x 80" x 40", turn radius 80", weight 15 lbs., 52 ohm feed takes PL-259 fitting.

A147-22 145 - 148 MHz, 1000 Watts, wind area 2.42 sq. ft.

**D-YAGI STACKING KITS** VPK includes horizontal mounting boom, harness, hardware and instructions for two vertically polarized yagis gives 3 dB gain over the single antenna.

| | |
|---|---|
| A14-VPK. | complete 4 element stacking kit |
| A14-SK. | 4 element coax harness only |
| A147-VPK. | complete 11 element stacking kit |
| A147-SK. | 11 element coax harness only |
| A449-SK. | 6 + 11 element coax harness only |

**E-4-6-11 ELEMENT YAGIS** The standard of comparison in VHF-UHF communications, now cut for FM and vertical polarization. The four and six element models can be tower side mounted. All are rated at 1000 watts with direct 52 ohm feed and PL-259 connectors.

| Model Number | A147-11 | A-147-4 | A449-11 | A449-6 | A220-11 |
|---|---|---|---|---|---|
| Boom/Longest ele. | 144"/40" | 44"/40" | 60"/12" | 25"/20" | 102"/26" |
| Wght./Turn radius | 4 lbs., 72" | 2 lbs., 44" | 4 lbs., 60" | 2 lbs., 18" | 5 lbs., 51" |
| Gain/F/B ratio dB | 13.2/28 | 9/20 | 13.2/28 | 11/25 | 13.2/28 |
| ½ Power beam | 48° | 66° | 48° | 60° | 48° |
| Wind area sq. ft. | 1.21 | .43 | .39 | .30 | .50 |
| Frequency MHz | 146-148 | 145-148 | 440-450 | 440-450 | 220-225 |

**F-FM TWIST** 12.4 dB Gain: Ten elements horizontal polarization for low end coverage and ten elements vertical polarization for FM coverage. Forward gain 12.4 dB, F/B ratio 22 dB, boom length 130", weight 10 lbs., longest element 40", 52 ohm Reddi Match driven elements take PL-259 connectors, uses two separate Feed lines.

A147-20T 145 - 147 MHz, 1000 watts, wind area 1.42 sq. ft.

# *HIGH PERFORMANCE VHF YAGIS*

## 3/4 , 1-1/4, 2 METER BEAMS

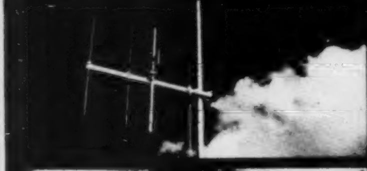
The standard of comparison in amateur VHF/UHF communications Cush Craft yagis combine all out performance and reliability with optimum size for ease of assembly and mounting at your site.

Lightweight yet rugged, the antennas have 3/16" O. D. solid aluminum elements with 5/16" center sections mounted on heavy duty formed brackets. Booms are 1" and 7/8" O.D. aluminum tubing. Mast mounts of 1/8" formed aluminum have adjustable u-bolts for up to 1-1/2" O.D. masts. They can be mounted for horizontal or vertical polarization. Complete instructions include data on 2 meter FM repeater operation.

New features include a kilowatt Reddi Match for direct 52 ohm coaxial feed with a standard PL-259 fitting. All elements are spaced at .2 wavelength and tapered for improved bandwidth.

| Model No. | A144 7 | A144 11 | A220 11 | A430 11 |
|---|---|---|---|---|
| Description | 2m | 2m | 1¼m | ¾m |
| Elements | 7 | 11 | 11 | 11 |
| Boom Lngth | 98" | 144" | 102" | 57" |
| Weight | 4 | 6 | 4 | 3 |
| Fwd. Gain | 11 dB | 13 dB | 13 dB | 13 dB |
| F/B Ratio | 26 dB | 28 dB | 28 dB | 28 dB |
| Fwd. Lobe @ ½ pwr. pt. | 46 | 42 | 42 | 42 |
| SWR @ Freq. | 1 to 1 | 1 to 1 | 1 to 1 | 1 to 1 |

cushcraft
CORPORATION



## PRICE LIST

| AMATEUR FM ANTENNAS | |
|---|---|
| A147-4 | $ 24.95 |
| A147-11 | 34.95 |
| A147-20T | 62.95 |
| A147-22 | 109.95 |
| A220-7 | 26.95 |
| A220-11 | 34.95 |
| A449-6 | 24.95 |
| A449-11 | 34.95 |
| AFM-4D | 69.95 |
| AFM-24D | 64.95 |
| AFM-44D | 64.95 |
| AR-2 | 19.95 |
| AR-6 | 26.95 |
| AR-25 | 26.95 |
| AR-220 | 24.95 |
| AR-450 | 24.95 |
| ARX-2 | 29.95 |
| ARX-2K | 16.95 |
| ARX-220 | 29.95 |
| ARX-450 | 29.95 |
| AMATEUR FM STACKING | |
| A14-SK | $ 18.95 |
| A14-VPK | 27.95 |
| A21-SK | 18.95 |
| A220-VPK | 27.95 |
| A147-SK | 18.95 |
| A147-VPK | 32.95 |
| A449-SK | 18.95 |
| A449-VPK | 27.95 |
| BIG WHEEL ANTENNAS | |
| ABW-125 | $ 18.95 |
| ABW-146 | 20.95 |
| ABW-144 | 30.95 |
| BLITZ BUG | |
| LAC-1 | $ 4.95 |
| LAC-2 | 4.95 |
| DX-ARRAYS-20 ELEMENT | |
| DX-120 | 40.95 |
| DX-220 | 49.95 |
| DX-420 | 39.95 |
| DX-ARRAY BALUNS | |
| DX-1BN | $ 10.95 |
| DX-2BN | 10.95 |
| DX-4BN | 10.95 |
| DX-VPB | 9.95 |
| SQUALO ANTENNAS | |
| ASQ-2 | 19.95 |
| ASQ-6 | 23.95 |
| ASQ-22 | 42.95 |
| ASQ-22K | 17.95 |
| ASQ-M | 17.95 |

| DX-ARRAY-40 ELEMENT | |
|---|---|
| DXX-140 | $ 69.95 |
| DXX-240 | 62.95 |
| DXX-440 | 49.95 |
| DX-ARRAY-80 ELEMENT | |
| DXX-180 | $129.95 |
| DXX-280 | 109.95 |
| DXX-480 | 99.95 |
| HF MONOBEAMS | |
| A-14-3 | $169.95 |
| A21-3 | 99.95 |
| A21-4 | 129.95 |
| A28-3 | 69.95 |
| A28-4 | 89.95 |
| MULTI BAND HF ANTENNAS | |
| ATB-34 | $259.95 |
| ATV-3 | 49.95 |
| ATV-4 | 69.95 |
| ATV-5 | 109.95 |
| PROLINE VHF BEAMS | |
| APL-22K | $ 22.95 |
| APL-62K | 32.95 |
| APL-65 | 169.95 |
| APL-210 | 129.95 |
| TWIST ANTENNAS | |
| A147-MB | $ 18.95 |
| A144-10T | 42.95 |
| A144-20T | 62.95 |
| A144-80QT | 419.95 |
| A432-20T | 59.95 |
| VHF/UHF BEAMS | |
| A50-3 | $ 30.95 |
| A50-5 | 59.95 |
| A50-6 | 69.95 |
| A50-10 | 119.95 |
| A144-7 | 26.95 |
| A144-11 | 36.95 |
| A430-11 | 34.95 |
| VHF/UHF STACKING KITS | |
| A11-SK | $ 18.95 |
| A17-SK | 18.95 |
| A61-SK | 18.95 |
| A535-SK | 18.95 |
| A561-SK | 21.95 |
| AQK-144 | 109.95 |
| AQK-444 | 69.95 |
| MOBILE ANTENNAS | |
| AMS-147 | $ 34.95 |
| ATS-147 | 32.95 |

## Tempo

TEMPO
FM Transceiver – S1

# 800 channels in the palm of your hand

**Tempo presents the S1 SYNCOM...the world's first synthesized 800 channel hand held transceiver**

This amazing pocket sized radio represents the year's biggest breakthrough in 2-meter communications. Other units that are larger, heavier and are similarly priced can offer only 6 channels. The SYNCOM'S price includes the battery pack, charger, and a telescoping antenna. But, far more important is the 800 channels offered by the S1. The optional touch tone pad shown in the illustration adds greatly to its convenience and we have available a 30 watt solid state power amplifier designed to give the SYNCOM S-1 the flexibility of operating as a mobile and base station as well.

### SPECIFICATIONS

| | |
|---|---|
| Frequency Coverage | 144 to 148 MHz |
| Channel Spacing | Every 5 KHz |
| Power Requirements | 9.6 VDC |
| Current Drain | 17 ma standby, 400 ma transmit |
| Batteries | Ni-cad battery pack included |
| Antenna Impedance | 50 ohms |
| Dimensions | 40 mm x 62 mm x 165 mm (1.6" x 2.5" x 6.5") |
| RF Output | Better than 1.5 watts |
| Sensitivity | Better than .5 microvolts |

**SUPPLIED ACCESSORIES**
Telescoping whip antenna, ni-cad battery pack, charger
**OPTIONAL ACCESSORIES**
Touch tone pad, tone burst generator, CTCSS chips, Rubber flex antenna.
Price ... $349.00 or with touch tone pad ... $399.00

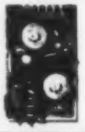
## DELUXE RECEIVER PREAMPLIFIERS

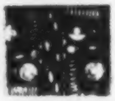
**Ideal for Receivers – Converters**
**High Gain – Low Noise**

**FEATURES:**
- ● Small size
- ● Increases sensitivity of most receivers
- ● Gold-plated copper shielding
- ● Single or double stage models
- ● Diode protected, dual-gated FETs

**SPECIFICATIONS:**
Power: 6 VDC to 18 VDC (12 VDC recommended)
Size: a. Single stage: 1" x 1⅜" x ⅝"
b. Double stage: 2" x 1⅜" x ⅝"
MOSFET: FT 0601, 500 MHz, dual-gate diode protected MOSFET

When ordering be sure to specify:
1. frequency of operation
2. single or double band stage
3. kit or assembled version





| FREQ. (MHz) | USE | STAGES | DELUXE GAIN dB | PREAMPLIFIER NF dB | WIRED |
|---|---|---|---|---|---|
| 50 to 54 | 6 METER | SINGLE<br>DOUBLE | 25<br>48 | 2<br>2 | $15.50<br>$28.50 |
| 108 to 144 | VHF AIRCRAFT | SINGLE<br>DOUBLE | 20<br>40 | 2.5<br>2.5 | $14.50<br>$26.50 |
| 135 to 139 | SATELLITE | SINGLE<br>DOUBLE | 20<br>40 | 2.5<br>2.5 | $14.50<br>$26.50 |
| 144 to 148 | 2 METER | SINGLE<br>DOUBLE | 20<br>40 | 2.5<br>2.5 | $14.50<br>$26.50 |
| 146 to 174 | HIGH BAND | SINGLE<br>DOUBLE | 20<br>40 | 2.5<br>2.5 | $14.50<br>$26.50 |
| 220 to 225 | 1¼ METER | SINGLE<br>DOUBLE | 18<br>35 | 2.5<br>2.5 | $14.50<br>$26.50 |
| 225 to 300 | UHF AIRCRAFT | SINGLE<br>DOUBLE | 15<br>30 | 2.5<br>2.5 | $14.50<br>$26.50 |

**DATA SIGNAL, INC.**

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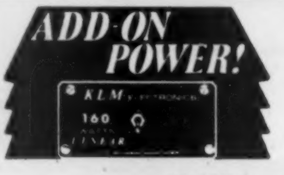

Highest quality, American-made "brand" transistors are fully protected for VSWR, short and overload, reverse polarity. Highly effective heat sinking assures long life, reliable performance. Black anodized containers...exclusive KLM extrusions, **have seven, full length fins on both sides!**

### KLM RF Power Amplifiers

- A simple, add-on-immediately RF amplifier.
- Merely coax-connect amplifier between antenna and transceiver.
- No tuning! Efficient strip-line broad band design.
- Automatic! Internal RF-sensor-controlled relay connects amplifier whenever transmitter is switched on. Manual, remote-position switching is optional.
- Models for 6,2,1¼ meters, 70CM amateur bands plus MARS coverage.
- Two types: **Class C** for FM/CW. **Linear** for SSB/AM/FM/CW.
- Negligible insertion loss on receive.
- American made by KLM.

| New Model | List Price |
|---|---|
| PA 2-25B | $74.95 |
| PA 4-70BL | 189.95 |
| PA 15-40BL | 109.95 |
| PA 15-80BL | 179.95 |
| PA 15-160BL | 259.95 |
| PA 45-140BL | 219.95 |
| PA 4-70BC | 189.95 |
| PA 15-60BC | 164.95 |
| PA 45-120BC | 209.95 |
| PA 4-40C | 169.95 |
| PA 15-35CL | 154.95 |
| PA 15-110CL | 279.95 |

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**ICOM**

IC-215—$239.00
2 Meter FM Portable

- An extremely rugged, high quality, radio with 15 channel capacity.
- The 'C' size cells may be replaced with rechargeable cells of the same size and very simple modification made to provide FULL CHARGE from either the auto electrical system or the IC-3PS power supply while the IC-215 is in operation. This feature is possible due to the BC-20 battery pack and charger.

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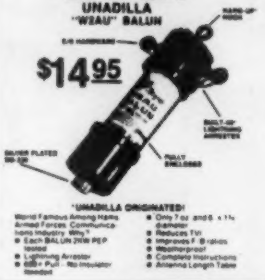
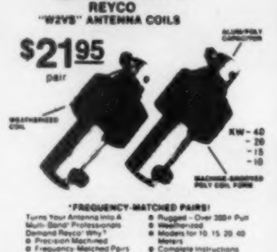
**THE BIG SIGNAL®**
**UNADILLA "W2AU" BALUN**
**$14.95**



**"UNADILLA ORIGINATED!**
World Famous Among Hams, Armed Forces, Communications Industry. Why?
- ● Each BALUN 2KW PEP tested
- ● Lightning Arrester
- ● 600# Pull - No Insulator Needed
- ● Only 7 oz. and 6 x 1¼ diameter
- ● Reduces TVI
- ● Improves F/B ratios
- ● Weatherproof
- ● Complete Instructions
- ● Antenna Length Table

**THE OLD RELIABLE™**
**REYCO "W2VS" ANTENNA COILS**
**$21.95 pair**



**"FREQUENCY-MATCHED PAIRS!**
Turns Your Antenna Into A Multi-Band Professional. Demand Reyco! Why?
- ● Precision Machined
- ● Frequency-Matched Pairs
- ● Only 6 oz. and 5½ x 1¼ diameter
- ● Rugged – Over 300# Pull
- ● Weatherized
- ● Models for 10, 15, 20, 40 Meters
- ● Complete Instructions
- ● Multi-Band Length/Tuning Data

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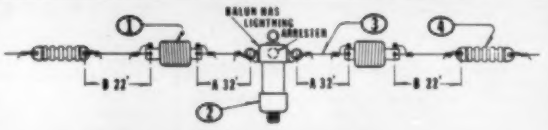


**W2AU/W2VS ● 5 BAND 10/80 METER ANTENNA KIT by UNADILLA/REYCO**

**GIVES YOU OPERATION ON 10 ● 15 ● 20 ● 40 ● 80 METERS**
(DESIGNED CLOSELY TO 5 BAND TRAP DIPOLE PARAMETERS PER A.R.R.L. HANDBOOK, HF ANTENNA CHAPTER 21 'A MULTIBAND TRAP ANTENNA')

Every Component of This Kit is a Highly Crafted, old Line UNADILLA/REYCO Product Time Tested by HAMS, COMMERCIAL & ARMED FORCES FACILITIES – AROUND THE WORLD – FOR OVER 10 YEARS!

**COMPLETE KIT (Nothing else needed)**
- ● 2 ea. W2VS REYCO KW-40 TRAPS
- ● 1 ea. W2AU 'BIG SIGNAL' BALUN 1:1
- ● 120 Ft. RUGGED #14-7 Strand Copper Wire
- ● 2 ea. W2AU SHATTERPROOF END-sulators
- ● INSTRUCTIONS
- ● $48.25

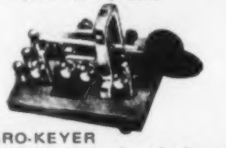
MICROWAVE FILTER COMPANY, INC.

Vibroplex

**THE IMPROVED "ORIGINAL" VIBROPLEX.** Suitable for All Classes of Transmitting Work Where Speed and Perfect Morse Are Prime Essentials. This great new Vibroplex is a smooth and easy working BUG. It has won fame on land and sea for its clarity, precision and ease of manipulation. Can be slowed down to 10 words per minute or less or geared to as high rate of speed as desired. Maintains the same high quality signal at whatever speed, insuring easy reception under all conditions. Weight 3 lbs. 8 oz. Standard $49.95
DeLuxe — Chromium base and top parts, with jeweled movement. $65.00

**THE "LIGHTNING BUG" VIBROPLEX** High Quality Signals at All Speeds. Flat pendulum model. Weight 3 lbs. 8 oz. Standard — Polished Chromium top partr, grey base. $65.00
Standard $49.95

**THE "CHAMPION" VIBROPLEX**
Weight 3 lbs. 8 oz. Without circuit closer. Standard finish only. Chromium finished top parts, with grey crystal base. $46.50



**VIBRO-KEYER**
Over the years, we have had many requests for Vibroplex parts to be used for construction of a keying mechanism for an electronic transmitting unit. This beautiful and most efficient "Vibro Keyer" is ideal for this job.
FEATURES OF THE "VIBRO-KEYER"
- Beautiful beige colored base, size 3½" x 4½", weight 2¾ pounds
- Same large size contacts as furnished on Deluxe Vibroplex.
- Same main frame and super finished parts as Deluxe Vibroplex
- Colorful red finger and thumb pieces.
- Has the same smooth and easy operating Vibroplex trunion level
- A real "Gem" adjustable to suit your own "taste"

Standard — $49.50; Deluxe Finish $65.00

**There's nothing like it!**

1979

**RADIO AMATEUR CALLBOOK** — There's nothing like it! Foreign Radio Amateur Callbook DX Listings — United States Callbook — All K&W Listings.
$14.95 – DX $15.95 – U.S.

No. SSK-1 $23.95
No. SSK-1CP-Chrome — $29.95

**NYE VIKING SQUEEZE KEY**
Extra-long, finger-fitting molded paddles with adjustable spring tension, adjustable contact spacing. Knife-edge bearings and extra large, gold plated silver contacts! Nickel plated brass hardware and heavy, die cast base with non-skid feet. Base and dust cover black crackle finished. SSK-1 — $23.45.
SSK-1CP has heavily chrome-plated base and dust cover. Price — $32.95

**CODE PRACTICE SET**
You get a sure, smooth, Speed-X model 310-001 transmitting key, linear circuit oscillator and amplifier, with a built-in 2" speaker, all mounted on a heavy duty aluminum base with non-skid feet. Operates on standard 9V transistor type battery (not included). Price — $20.75
**PHONE PATCH** Model No. 250-46-1 measures 6-1/2" wide, 2-1/4" high and 2-7/8" deep. List price, $36.50. Model 250-46-3, designed for use with transceivers having a built-in speaker, has its own built-in 2" x 6" 2 watt speaker. Measures 6-1/2" wide, 2-1/4" high and 2-7/8" deep. Price — $46.50

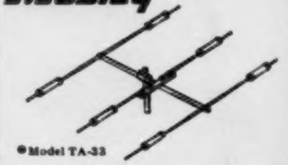
No. 114-320-003 — $11.70
No. 114-322-003 — Brass — $12.10

No. 114-320-001 — $9.70
No. 114-322-001 — Brass — $10.15

No. 114-310-003 — $9.65
No. 114-312-003 — Brass — $10.25

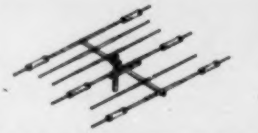
**NYE VIKING SPEED-X KEYS**
NYE VIKING Standard Speed-X keys feature smooth, adjustable bearings, heavy-duty silver contacts, and are mounted on a heavy oval die cast base with black wrinkle finish. Available with standard, or Navy knob, with, or without switch, and with nickel or brass plated key arm and hardware.
**Pamper yourself with a Gold-Plated NYE VIKING KEY!**
Model No. 114-31C-004GP has all the smooth action features of NYE Speed-X keys in a special "presentation" model. All hardware is heavily gold plated and it is mounted on onyx-like jet black plastic sub-base. Price $50.00

**Mosley**



●Model TA-33

- Model TA-33, 3 elements, 10.1 dB forward gain (over isotropic source) – $264.00
- Model TA-33 Jr., 3 elements, 10.1 dB forward gain (over isotropic source) – $197.00
- Model MPK-3, 7500 Watts AM/CW and 2000 Watts P.E.P. SSB – $67.75
- Model TA-36, 6 elements – $392.75
- AK-60 mast plate adapter – $14.50
- Model CL-33, 3 elements – $304.75
- Model CL-36, 6 elements – $392.75
- Model CL-203, 3 elements – $290.00
- Model TA-40 KR – 40 meter conversion kit – $119.50



**Wilson Electronics Corp.**

COMMON FEATURES
- 6 Channel Operation
- Individual Trimmers on all TX/RX Xtals
- All Xtals plug in
- Microswitch control of TX/RX
- Rubber Flex Antenna furnished
- Convenient Size . . . Fits in hip pocket
- 90 Day Warranty
- Can be modified for MARS or CAP
- Built for rugged use
- Inexpensive power source with rechargeable Ni-Cads
- Easily accessible circuitry
- One pair Xtals furnished with each radio installed

1402SM 146.52/.52 4502SM 446.00/.00
1405SM 146.52/.52 2202SM 223.50/.50

**NEW 2 METER MARK II AND MARK IV**
As the smallest size hand-helds ever marketed, the radios feature excellent adjacent channel selectivity, and innermod/image rejection. The attractive blue-gray Lexan® outer case is rugged and durable. Mark II (2.5 watt) $229.98. Mark IV (4 watt) $259.98

Riding the crest of the new wave of multi-channel two-meter rigs is the Wilson WE-800. Designed as an all-purpose mobile or portable unit, the WE-800 is loaded with enough features to satisfy even the most discriminating amateur. The "800" is for channels, from 144 to 148 MHz in 5 KHz steps, up or down 500 KHz for your local repeater. There are even provisions for pre-programming five of your favorite frequencies or changing to two optional offsets, in case your area repeater is nonstandard. Add to these features; internal rechargeable power pack optional (uses 10 AA NiCad cells, not included), detachable rubber flex antenna, built-in S-meter/output indicator, built-in high-low power option switch (1 or 12 watts, when used mobile or base), built-in connectors for external antenna, speaker and power. Whether you're just getting your feet wet on two-meters, or a seasoned amateur, you'll find the WE-800 to be the most lightweight, versatile base/mobile/portable rig on the market today. The WE-800 comes complete with plug-in speaker-microphone, mobile mounting bracket/handle, rubber flex antenna, 12V DC Charger Cord, instruction booklet and 90 day limited warranty. Rechargeable internal battery pack optional.

2 Meter
Portable Amateur
800 channel
Synthesized Radio
1 and 12 Watts RF Output
144-148 MHz
$499.00

GENERAL SPECIFICATIONS

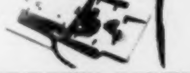
| | |
|---|---|
| • Frequency range | 144.000 – 147.995 MHz |
| • No. of channels | 790 @ 5 kHz or 395 @ 10 kHz |
| • Operating mode | Direct frequency modulation |
| • Type of communication | Simplex or repeater offset ±600 kHz |
| • Operating voltage | 13.8 VDC negative ground<br>(10 to 15 VDC range) |
| • Current drain | Transmit 390 mA @ 1 watt output<br>2 amps @ 12 watts output<br>Receive 45 mA squelched<br>250 mA at full AF rated output |
| • Antenna impedance | 50 ohms nominal |
| • Size | 8 1/4 x 6 3/4 x 1 7/8 inches<br>(209.6 x 171.5 x 47.6 mm) |
| • Weight | 1 lb. 15 oz. [illegible]<br>(1 lb. 11 oz. [illegible]) with batteries |
| • Frequency determining method | C-MOS phase locked loop |
| • Offset Option | Two optional offset [illegible]<br>[illegible] available |

**LEATHER CARRYING CASE**
- LC-1 for 1402 SM – $18.95
- LC-3 for Mark II, IV – $16.95
- LC-2 – all others – $18.95

**110V-AC DESK BATTERY CHARGER**
For new units Mark II, IV — use the Model BC-2; for Models 1402, 1405, 1407, 2202 and 4502, use Model BC-1. $40.95

**WATT BATTERY CHARGER**
110 V-AC Charger . . . use WC-12 ($19.95) for 1402, 1405, 1407, 2202, 4502; use WC-14 ($15.95) for Mark II, IV.
ACCESSORIES
BC-12 – $14.95
CIGARETTE LIGHTER MOBILE POWER PLUG
SPEAKER MIC
SM1 – for Models 1402, 1405, 1407, 2202, 4502.
SM3 – (Mark II, Mark IV)
SM2 for Models 1402, 1405, 1407, 2202, 4502. ($30.95).
RECHARGEABLE BATTERY PACKS
Use the following Ni-Cad Packs for the unit you select:
BP-1 – 10 loose cells – 500 mA (1402, 1405) – $18.95
BP-2 – strapped cells – 600 mA (1405, 2202, 4502) – $24.95
BP-4 – Mark II, Mark IV pack – $20.95
BP-7 – 1407 SM high power pack – $24.95
Other options include: Touch Tone® Pad (installed only), TE-1 Tone Encoder, TE-2 Encoder/Decoder, BNC Rubber Duck Antenna, TNC Rubber Duck Antenna.

**SAVE YOUR RADIO!**



DESIGNED FOR COMMERCIAL USE UP TO 1000 MHZ.

The **TUFTS SAVE-YOUR-RADIO** bracket can save you a bundle . . . and a lot of hassle. Why worry about rig ripoff? The **TUFTS SYR** bracket mounts quickly and easily in your car and makes it possible to snap your rig out of its bracket when you park and put it out of sight.

The connector system has a special coaxial cable connector which will provide you with a lossless connection right up to 1000 MHz! No loss! In addition to the quick snap connector there are also four power and accessory connections which are made automatically when the rig is slid into its bracket . . . just what you need for feeding power and loudspeaker connections to the set.

This is a rugged bracket and connector system . . . it'll take a beating. There is a hole on each side of the 16 gauge steel plate for a padlock in case you want to leave the rig for short periods in its bracket. They'll have to rip out the dash to get it . . . and it won't be the first time for that.

With two of these brackets you can bring the mobile rig into the house and use it in seconds. On trips you can take an AC supply for the rig and use it in your hotel room. Price: $29.95

JMR
MOBIL-EAR™

**$69.95**

**Two-way-radio headset with superior fidelity Electret-Capacitor boom microphone and palm-held talk switch.**

**FOR BROADCAST-QUALITY TRANSMISSION AND RECEPTION FOR BOTH MOBILE UNITS AND BASE STATIONS.**

- Boom-mounted electret-capacitor microphone delivers studio-quality, undistorted voice reproduction. Variable gain control lets you adjust for optimum modulation.
- Cushioned earcup lets you monitor in privacy – no speaker blare to disturb others. Blocks out environmental noises, too. Made of unbreakable ABS plastic.
- Headband self-adjusts for comfortable wear over long hours. Spring-flex hinge lets you slip headset on and off with just one hand. Reversible for right or left ear.
- Headset can be hung on standard microphone clip.
- Compact palm-held talk switch lets you keep *both* hands on the wheel for safer driving. Made of unbreakable ABS plastic.
- Built-in FET transistor amplifier adapts microphone output to any transceiver impedance.
- Compatible with most two-way radios including 40-channel CB units.
- Built-in Velcro pad for easy mounting of the talk switch.
- Made in U.S.A.

**SPECIFICATIONS**

| | |
|---|---|
| Earphone impedance and type: | 8 ohms, dynamic |
| Microphone type: | Electret capacitor |
| Microphone frequency response: | 200-6000 Hz |
| Amplifier type: | FET transistor, variable gain |
| Amplifier battery power: | 7-volt Mallory TR-175 |
| Switching: | Relay or electronic |

**IDEAL FOR EVERY TWO-WAY RADIO COMMUNICATIONS NEED . . .**

CB operators • Amateur radio operators • Police and fire vehicles • Ambulances and emergency vehicles • Taxis and truckers • Marine pleasure and work boats • Construction and demolition crews • Industrial communications • Security patrols • Airport tower and ground crews • Remote broadcast and TV-camera crews • Foresters and fire-watch units •

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**J.W. Miller Presents...**

**RF Speech Processor/Model RF-440**
**From DAIWA CORPORATION**

Increases talk power with splatter free operation RF clipping assures low distortion. Simply install between microphone and transmitter.

Talk Power: Better than 6 dB
Clipping Threshold: Less than 2 mV at 1 KHz
Bandwidth: 2200 Hz at 6 dB down
Frequency Response: 300-3000 Hz at 12 dB down
Distortion: Less than 3% at 1 KHz, 20 dB clipping
Output Level: More than 50 mV at 1 KHz
Power Requirement: 115 VAC, 60 Hz, 1.4 W
or 13.5 VDC, 55 mA
Dimensions: 150 x 70 x 150 mm, 5 x 2.5 x 5 in

**$135.95**

**J.W. Miller Division**
**BELL INDUSTRIES**

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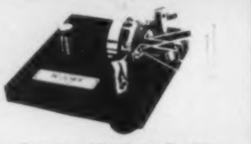

The Bencher Ultimate Paddle . . . a dual lever, iambic keyer paddle that will increase your speed, accuracy & operating comfort.

● ADJUSTABLE CONTACT POINT SPACING – Precision screw adjustments on each set of contacts make exact settings easy. Contact posts are split and locked by set screws, eliminating the need for locknuts.

● WIDE RANGE OF TENSION ADJUSTMENT – Tension on finger knobs is maintained by a long expansion spring. Dual screw adjustments adjust spring tension to match your "fist."

● SELF ADJUSTING NEEDLE BEARINGS – Keying shafts pivot in nylon bearings that "float" on machined brass fittings. Spring tension prevents free play and slop; eliminates contact bounce and backlash.

● SOLID SILVER CONTACT POINTS – The contact points are solid silver for a lifetime of flawless keying.

● PRECISION-MACHINED COMPONENTS – Main frame, contact posts, spring post and bearing ring are all machined from solid brass . . . polished and chrome plated for durability and rich appearance. The Bencher Paddle looks as good as it works!

● HEAVY STEEL BASE; NON-SKID FEET – Finished in an attractive black wrinkle finish (chrome plating optional), the base measures 9.5cm x 10.2cm x 1.3cm thick. It weighs 1 kilogram, and with its non-skid rubber feet is as solid as a rock.

Model BY-1 Standard Black Base . . . $39.95. Model BY-2 Polished Chrome Base . . . $49.95.

**BENCHER, INC.**

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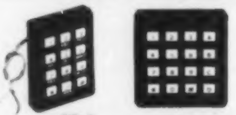

M series is for mounting to surfaces inaccessible from the rear (walls, mobiles, systems interface, panels, test equipment). K series is self-contained with a relay inside the encoder. When keys are pressed contact closer occurs with a 2 sec. delay (adjustable). Contacts are rated at 110 mA @ 28 volts switched, 500 mA carry. PP-2K contains delay exclusion for the fourth column. However, by jumping D-5, 4th column is restored. Unit is operable from 4.5-60 volts at temperatures from 0°-140° F. Output level will drive any transmitter or system. Adjustable output level is controlled with an extremely stable multiturn trimpot, w/access from the front of the encoder (not behind), saving time for level setting, which amounts to hours when involved w/a system.

PP-1 $55 (12 keys), PP-1m $55 (lettering optional add $1), PP-1K $66; PP-2 $58; PP-2m $58 (lettering optional add $1); PP-2K $69. PP-1A $68 (for standard comm hand-held).

**Pipo Communications**

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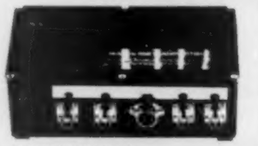
## MICROWAVE MODULES
## TEXAS RF



MICROWAVE MODULES
HIGH PERFORMANCE UNITS
FOR 144, 432 and 1296 MHz

144 MHZ MOSFET CONVERTER – MMC144/28
With dual protected gate Mosfet RF Amplifier and Mixer stages
Input frequency: 144-146 MHz
I.F. output frequency: 28-30 MHz
Typical gain: 30 dB
Guaranteed maximum noise figure: 2.5 dB
Typical image rejection: 65 dB
Crystal oscillator frequency: 116 MHz (zener controlled)
Maximum frequency error at 144 MHz: 3 KHz
Power requirements: 12 volts DC ±20% at 50 mA
Other I.F. output frequencies available:
12-14, 14-16, 18-20, 24-26 MHz

144 MHZ MOSFET CONVERTER – MMC 144/28 LO
Similar to the MMC144/28, this unit features an additional 116 MHz buffer amplifier to provide a local oscillator signal suitable for transmitter use.

144 MHZ DOUBLE CONVERSION MOSFET CONVERTER – MMC144/2 – MMC144/4
This unit has been developed to meet the requirement for a converter suitable for use with receivers having better performance at lower frequencies.
Input frequency: 144-146 MHz
I.F. output frequencies available: 2-4, 4-6 MHz
Oscillator frequency: 71 MHz (2-4 MHz IF),
70 MHz (4-6 MHz IF)
Maximum frequency error at 144 MHz: 3 KHz
Typical gain: 30 dB
Guaranteed maximum noise figure: 2.5 dB
Power requirements: 12 volts DC ±25% at 30 mA

144 MHZ DUAL OUTPUT MOSFET PREAMPLIFIER – MMA144
This two-stage mosfet preamplifier has two separate isolated outputs, for loading two receivers, for example.
Input frequency: 144-146 MHz
Typical gain: 18 dB
Guaranteed maximum noise figure: 2.5 dB
Bandwidth: 5 MHz at -3 dB, 8 MHz at -10 dB
Power requirements: 12 volts DC ±25% at 25 mA

432 MHZ MOSFET CONVERTER – MMC432/144
Two RF Amplifiers and a Mosfet Mixer combine high sensitivity and low cross-modulation characteristics.
Input frequency: 432-434 MHz
I.F. output frequencies available: 14-16, 18-20, 28-30, 144-146 MHz
Typical gain: 30 dB
Guaranteed maximum noise figure: 3.8 dB
Crystal oscillator frequency: 101 MHz (28-30 MHz IF)
(zener controlled): 96 MHz (144-146 MHz IF)
Maximum frequency error at 432 MHz: 5 KHz
Power requirements: 12 volts DC ±25% at 46 mA

1296 MHZ CONVERTER – MMC 1296/28 – MMC1296/144
A hybrid ring mixer with a matched pair of hot-carrier diodes, driving a dual-gate mosfet I.F. amplifier.
Input frequency: 1296-1298 MHz
I.F. output frequencies available: 28-30, 144-146 MHz
Typical gain: 25 dB
Guaranteed maximum noise figure: 8.5 dB
Crystal oscillator frequency: 105.666 MHz (28-30 MHz IF)
(zener controlled): 96 MHz (144-146 MHz IF)
Maximum frequency error at 1296 MHz: 20 kHz
Power requirements: 12 volts DC ±25% at 80 mA
Connectors: 50 ohm BNC

| | |
|---|---|
| **TRANSVERTERS:** | |
| MMT 144/28 . . . . . . . | 259.95 |
| MMT 144/50 . . . . . . . | 259.95 |
| MMT 432/28S. . . . . . . | 329.95 |
| MMT 432/50S. . . . . . . | 329.95 |
| MMT 432/144S . . . . . . | 389.95 |
| **RECEIVING CONVERTERS:** | |
| MMC 144/28 . . . . . . . | 65.95 |
| MMC 144/28LO. . . . . . | 70.95 |
| MMC 432/28S. . . . . . . | 95.95 |
| MMC 432/144. . . . . . . | 95.95 |
| MMC 1296/28. . . . . . . | 85.95 |
| MMC 1296/144 . . . . . . | 85.95 |
| **VARACTOR TIPLER:** | |
| MMV 1296. . . . . . . . . | 110.95 |
| **ATTENUATORS:** | |
| MAA 16 . . . . . . . . . . | 27.95 |

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**ASTATIC MICROPHONES**

| | |
|---|---|
| T-UP8-D104 transistorized w/push bar base | $64.20 |
| T-UG8-D104 transistorized | $57.80 |
| T-UG9-D104 "Silver Eagle" transistorized | $71.40 |
| UG-D104 ceramic or crystal | $48.80 |

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## AMPHENOL

BUNKER RAMO

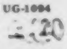
**SERIES 31 — BNC CONNECTORS**
Amphenol's BNC connectors are small, lightweight, weatherproof connectors with bayonet action for quick disconnect applifications.

Shells, coupling rings and male contacts are accurately machined from brass. Springs are made of beryllium copper. All parts in turn are ASTRO-plated® to give you connectors that can take constant handling, high temperatures and resist abrasion.

**BNC BULKHEAD RECEPTACLE 31-221-385 UG-1094** Mates with any BNC plug. Receptacle can be mounted into panels up to 104" thick. $1.25

UG-1094

**BNC (M) TO UHF (F) ADAPTER 309-2900-385 UG 255** Adapts any BNC jack to any UHF plug. $3.63


UG-255

**DOUBLE MATE ADAPTER 83-877-385** Both coupling rings are free turning. Connects 2 female components. $2.72

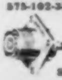
83-877-385

**JACK ADAPTER $1.95 575-102-385** Adapts 83-1SP-385 to Motorola type auto antenna jack or pin jack.

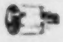
575-102-385

**PANEL RECEPTACLE 83-1R-385 SO239** Mounts with 4 fasteners in 21/32" diameter hole. $1.17

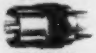
**PANEL RECEPTACLE**


SO239

**BNC(F) TO UHF (M) ADAPTER 31-028-385 UG-273** Adapts any BNC plug to any UHF jack. $2.30


UG-273

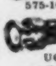
**PUSH-ON**
**83-5SP-385** Features an unthreaded, springy shell to push fit on female connectors. $2.27


83-5SP-385

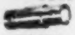
**LIGHTNING ARRESTOR 575-105-385** Eliminates static build-up from antenna. Protects your valuable equipment against lightning damage. $4.80

575-105-385

**BNC PLUG 31-002-385 UG-88** Commonly used for communications antenna lead cables. For RG 55/U & RG 58/U cables. $1.59


UG-88

**BNC STRAIGHT ADAPTER 31-219-385 UG-914** 1 9/32" long, allows length of cables to be joined. Mates with BNC plugs. $2.12


UG-914

**BNC PANEL RECEPTACLE 31-003-385 UG-290** Mounts with 4 fasteners in 29/64" diameter hole. $1.74

UG-290

**83-879-385 SO239SH** Mounts in single 21/32" diameter hole. Knurled lock nuts prevent turning. $1.59

SO239SH

**BNC ANGLE ADAPTER 31-009-385 UG-306** Adapts any BNC plug for right angle use. $4.23

UG-306

**BNC TEE ADAPTER 31-008-385 UG-274** Adapts 2 BNC plugs to 31-003-385 or other female BNC type receptable. $4.56

UG-274

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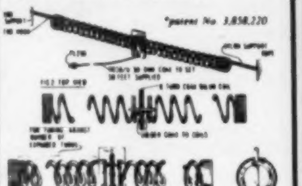
## slinky

**SLINKY! $43.95 Kit A LOT of antenna in a LITTLE space New Slinky® dipole* with helical loading radiates a good signal at 1/10 wavelength long!**

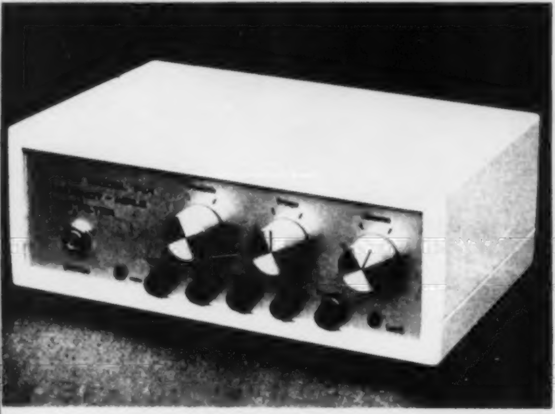


*patent No. 3,858,220

This electrically small 80/75, 40 & 20 meter antenna operates at any length from 24 to 70 ft. ● no extra balun or transmatch needed ● portable – erects & stores in minutes ● small enough to fit in attic or apt. ● full legal power ● low SWR over complete 80/75, 40 & 20 meter bands ● much lower atmospheric noise pick-up than a vertical & needs no radials ● kit incl. a pr. of specially-made 4" dia. by 4" long coils, containing 335 ft. of radiating conductor, balun, 50 ft. RG58/U coax, PL259 connector, nylon rope & manual.

**DATONG ELECTRONICS LIMITED**

## FREQUENCY-AGILE AUDIO FILTER Model FL1



**FUNCTION.**

The Datong Frequency-Agile Audio Filter is intended primarily for post-detector signal filtering in HF and LF communications receivers for SSB and CW. It offers an unusually versatile combination of benefits to the user including:

**For the SSB operator.**

✱ Fast automatic suppression of interfering heterodyne whistles in the range 200 - 3000 Hz by a unique search-lock-and-track notch filter. The tracking notch can be left in circuit with no audible effect until a whistle appears in which case the whistle will 'disappear' within typically one second. This capability provides a highly effective countermeasure for the great majority of the heterodynes which frequently appear on-channel in to-days crowded LF and HF bands.

✱ A continuously adjustable audio 'window' or a variable-width notch to improve reception in the presence of other off-tune SSB, RTTY or SSTV signals.

**For the CW operator.**

✱ Continuously variable centre-frequency (200 - 3000 Hz) and bandwidth (25 - 1000 Hz) for perfect matching of receiver passband to changing band conditions, sending speeds, and personal preference.

✱ Flat-topped, steep-skirted response shape for optimum ease of tuning combined with excellent noise rejection.

✱ Linear tuning law with bandwidth independent of frequency and gain independent of bandwidth for natural 'feel'.

**$179.95**

---

the indispensable

## BIRD 43 THRULINE WATTMETER

| Power Range | Frequency Bands (MHz) 2-30 | 25-60 | 100-250 | 200-500 | 400-1000 |
|---|---|---|---|---|---|
| 5 watts | – | 5A | 5C | 5D | 5E |
| 10 watts | – | 10A | 10C | 10D | 10E |
| 25 watts | – | 25A | 25C | 25D | 25E |
| 50 watts | 50H | 50A | 50C | 50D | 50E |
| 100 watts | 100H | 100A | 100C | 100D | 100E |
| 250 watts | 250H | 250A | 250C | 250D | 250E |
| 500 watts | 500H | 500A | 500C | 500D | 500E |
| 1000 watts | 1000H | 1000A | 1000C | 1000D | 1000E |
| 2500 watts | 2500H | | | | |
| 5000 watts | 5000H | | | | |

| | |
|---|---|
| MODEL 43 | $125.00 |
| Elements (Table 1) 2-30 MHz | 45.00 |
| Elements (Table 1) 25-1000 MHz | 38.00 |
| Carrying case for Model 43 & 6 elements | 27.50 |
| Carrying case for 12 elements | 17.00 |

**READ RF WATTS DIRECTLY! (Specify Type N or SO239 connectors) 0.45 – 2300 MHz, 1-10,000 Watts ±5%, low insertion VSWR – 1.05. Unequalled economy and flexibility. Buy only the element(s) covering your present frequency and power needs, add extra ranges later if your requirements expand.**

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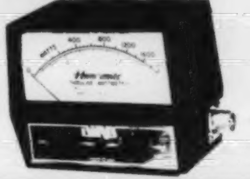
**BIRD Electronic Corporation**

## VHF model 4362
## HF model 4360



The 4360, 4362 HAM-MATE Directional Wattmeters are insertion type instruments for measuring forward or reflected power in 50-ohm coaxial transmission lines. They are direct descendants of the model 43 THRULINE® Wattmeter — the professional standard of the industry—and will accurately measure RF power flow under any load condition. Each wattmeter is made up of a precisely machined section of 50-ohm line, a rotatable sensing element and meter calibrated in watts, all mounted in a high-impact plastic housing. It is this type of solid construction and the directional THRULINE coupling circuit, **without toroids**, that account for the superiority of the HAM-MATE Wattmeters.

---

## THRULINE® RF Directional Wattmeter

**model 4431**

Power Rating ............ 5000 watts - 2 to 30 MHz
1000 watts - 30 to 1000 MHz*
Impedance ............ 50 ohms nominal
Insertion VSWR (with N Connectors) ............ 1.07 to 1.0 max.*
Insertion Loss ............ 0.1dB Max. (2 - 512 MHz)
0.2dB Max. (512 - 1000 MHz)*
RF Coupling ............ 15 to 70 dB
Accuracy of Wattmeter ............ ± 5% of F.S.
RF Coupling Connector ............ Female BNC
Primary Line Connector ............ Female N (Normally Supplied)
(Other QC Connectors can be supplied)

*Price: $175. Elements $36 – $75*

- **Model 43 Power Measurement Versatility**
- **Variable RF Signal Sampler (built-in)**

Model 4431 provides an RF signal sample for use with counters, oscilloscopes, spectrum analyzers, etc., at the same time a power measurement is made.

Amplitude of the RF sample is adjustable by depth-of-insertion control knob on the front of the wattmeter.

Model 4431 uses the same Plug-in Elements as the Model 43 (within its frequency and power limitations).

---

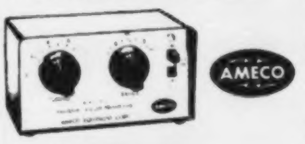
**Now you can receive the weak signals with the Ameco PT-2 pre-amplifier!**

Model PT-2 is a continuous tuning 6-160 meter Pre-Amp specifically designed for use with a transceiver. The PT-2 combines the features of the well-known PT with new sophisticated control circuitry that permits it to be added to virtually any transceiver with no modification. No serious ham can be without one. Price: $74.95.

**AMECO**

- Improves sensitivity and signal-to-noise ratio.
- Boosts signals up to 26 db.
- For AM or SSB.
- Bypasses itself automatically when the transceiver is transmitting.
- FET amplifier gives superior cross modulation protection.
- Simple to install.
- Advanced solid-state circuitry.
- Improves immunity to transceiver front-end overload by use of its built-in attenuator.
- Provides master power control for station equipment.

## ALL BAND PREAMPLIFIERS



- 6 THRU 160 METERS
- TWO MODELS AVAILABLE
- RECOMMENDED FOR RECEIVER USE ONLY
- INCLUDES POWER SUPPLY

MODEL PLF employs a dual gate FET providing noise figures of 1.5 to 3.4 db., depending upon the band. The weak signal performance of most receivers as well as image and spurious rejection are greatly improved. Overall gain is in excess of 20 db. Panel contains switching that transfers the antenna directly to the receiver or to the Preamp. Model PLF 117V AC, 60 Hz. Wired & Tested ...... $49.95

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## YAESU

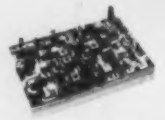
FT-301 or FT-301D

| | | |
|---|---|---|
| **COMPETITION GRADE HF XCVR** | | |
| FT-901DM | 160-10M XCVR | $1459 |
| FT-901D | 160-10M XCVR | 1259 |
| FT-901DE | 160-10M XCVR | 1259 |
| **INTERNATIONAL GRADE HF XCVR** | | |
| FT-101F | 160-10M XCVR | 799 |
| FT-101FE | 160-10M XCVR | 759 |
| FT-101FX | 160-10M (AC Only) | 699 |
| **SOLID STATE HF XCVR** | | |
| FT-301D | 160-10M 240W Digital | 935 |
| FT-301 | 160-10M 240W Analog | 769 |
| FT-7 | 80-10M 20W XCVR | 540 |
| **VHF TRANSCEIVERS** | | |
| CPU-2500 | FM Mobile | TBA |
| FT-225R | 2M XCVR | 640 |
| FT-225RD | 2M XCVR W/Digital | 695 |
| FT-227R | FM Mobile 2M | 395 |
| FT-227RA | AutoScan 4 Mem. 2M | TBA |
| FT-625RD | All Mode 6M | 895 |
| FT-625R | All Mode 6M | 840 |
| **SOLID STATE RECEIVERS** | | |
| FRG-7 | Communications RCVR | 315 |
| FRG-7000 | All Band HF RCVR | 625 |
| FR-101S | 160-2M RCVR | 599 |
| FR-101DD | 160-10M/SW Digital | 749 |
| **INTERNATIONAL GRADE TRANSMITTER** | | |
| FL-101 | 160-10M XMTTR | 649 |
| **LINEAR AMPLIFIER** | | |
| FL-2100B | 80-10M Linear | 529 |
| **TEST EQUIPMENT** | | |
| YC-500J | 500 mHz 10 PPM | 239 |
| YC-500S | 500 mHz 1 PPM | 289 |
| YC-500E | 500 mHz 0.02 PPM | 557 |
| YP-150 | Dummy Load | 89 |
| **ACCESSORIES FOR ALL MODELS** | | |
| YH-55 | Headset | 19 |
| YD-148 | Hi-LOZ Desk Mike | 30 |
| YD-844A | Hi-LOZ Desk Mike | 30 |
| YD-846 | HiZ Hand Mike | 16 |
| YM-6 | LOZ Hand Mike | 16 |
| FF-501DX | 520 Lo Pass Filter | 34 |
| — | Code/RTTY Decoder | TBA |
| QTR-24 | World Clock | 35 |
| **ACCESSORIES FOR FR-101 RCVR** | | |
| FC-2 | 2M Converter | 25 |
| FC-6 | 6M Converter | 24 |
| FM-1 | FM Adapter | 20 |
| XF30D | FM Filter | 40 |
| — | AUX/SW Crystals | 5 |
| **ACCESSORIES FOR 901 SERIES** | | |
| FA-9 | Fan | 20 |
| FM-901 | FM Adapter | 45 |
| KY-901 | Keyer Unit | 45 |
| MU-901 | Memory Unit | 124 |
| DC-901 | DC-DC Unit | 60 |
| SP-901 | Speaker | 35 |
| SP-901P | Speaker/Patch | 74 |
| FTV-901 | 2M/70cm XVTR | TBA |
| YO-901 | Monitor Analyzer | TBA |
| FV-901 | Synthesized VFO | 415 |
| FC-901 | Antenna Tuner | 169 |
| XF8.9 HC | Filter | 46 |
| XF8.9 B | Filter | 46 |
| **ACCESSORIES FOR 301 SERIES** | | |
| FC-301 | Antenna Tuner | 130 |
| FV-301 | VFO | 125 |
| FP-301 | Power Supply | 157 |
| FP-301D | P/S Identifier | 239 |
| YO-301 | Monitor Scope | 263 |
| SP-120 | External Speaker | 25 |
| XF89B | AM Filter | 40 |
| XF89C | CW Filter | 40 |
| XF92A | SSB/Proc. Filter | 45 |
| E.R.B. | External Relay Box | 17 |
| LL-301 | Phone Patch | 40 |
| MMB-4 | Mobile Mount | 23 |
| **ACCESSORIES FOR 101 SERIES** | | |
| FTV-650B | 6M Transverter | 239 |
| FTV-250 | 2M Transverter | 275 |
| FV-101B | VFO | 137 |
| SP-101B | Speaker | 23 |
| SP-101PB | Speaker/Patch | 67 |
| FA-9 | Fan | 20 |
| XF30B | AM Filter | 40 |
| XF30C | CW Filter | 40 |
| DC-1 | DC/DC Converter | 50 |
| RFP-102 | Processor (early) | 79 |
| RFP-104 | Processor (late) | 79 |
| FT-101 | Serv./Maint. Manual | 25 |
| YO-101 | Monitor Scope | 300 |
| YC-601B | Digital Readout/ Frequency Counter | 233 |
| MMB-1 | Mobile Mount | 23 |
| **ACCESSORIES FOR VHF EQUIPMENT** | | |
| FB-1424 | Marker Unit (FT620B) | 25 |
| MMB-2 | FT2A Mobile Mount | 23 |
| MMB-4 | 620B/221 Mob. Mount | 23 |
| FT-221 | Serv./Maint. Manual | 15 |
| YC-221 | Digital Display | 119 |
| MMB-5 | FT227R Mobile Mount | 8 |
| FP-4 | 4 amp Power Supply | 56 |
| FRG-7 | Communications Receiver | 315 |
| FRG-7000 | All Band HF Receiver | 625 |
| QTR-24 | World Clock | 35 |

# Vhf engineering

## THE WORLD'S MOST COMPLETE LINE OF VHF-FM KITS AND EQUIPMENT

### RECEIVERS

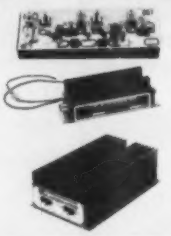


| | | |
|---|---|---|
| RX28C | 28-35 MHz FM receiver with 2 pole 10.7 MHz crystal filter | $ 64.95 |
| RX28C W/T | same as above–wired & tested. | 129.95 |
| RX50C Kit | 30-60 MHz rcvr w/2 pole 10.7 MHz crystal filter | 64.95 |
| RX50C W/T | same as above–wired & tested | 129.95 |
| RX144C Kit | 140-170 MHz rcvr w/2 pole 10.7 MHz crystal filter | 74.95 |
| RX144C W/T | same as above–wired & tested | 131.95 |
| RX220C Kit | 210-240 MHz rcvr w/2 pole 10.7 MHz crystal filter | 74.95 |
| RX220C W/T | same as above–wired & tested | 131.95 |
| RX432C Kit | 432 MHz rcvr w/2 pole 10.7 MHz crystal filter | 84.95 |
| RX432C W/T | same as above–wired & tested | 142.95 |
| RXCF | accessory filter for above receiver kits gives 70 dB adjacent channel rejection | 9.95 |
| RF28 Kit. | 10 mtr RF front end 10.7 MHz out | 13.50 |
| RF50 Kit. | 6 mtr RF front end 10.7 MHz out | 13.50 |
| RF144D Kit | 2 mtr RF front end 10.7 MHz out | 18.50 |
| RF220D Kit | 220 MHz RF front end 10.7 MHz out | 18.50 |
| RF432 Kit | 432 MHz RF front end 10.7 MHz out | 29.50 |
| IF 10.7F Kit | 10.7 MHz IF module includes 2 pole crystal filter | 29.50 |
| FM455 Kit | 455 KHz IF stage plus FM detector | 18.50 |
| AS2 Kit | audio and squelch board | 16.00 |

### TRANSMITTERS

| | | |
|---|---|---|
| TX50 Kit | transmitter exciter, 1 watt, 6 mtr. | 44.95 |
| TX50 W/T | same as above–wired & tested | 71.95 |
| TX144B Kit | transmitter exciter–1 watt–2 mtrs | 34.95 |
| TX144B W/T | same as above–wired & tested. | 65.95 |
| TX220B Kit | transmitter exciter–1watt–220 MHz | 34.95 |
| TX220B W/T | same as above–wired & tested | 65.95 |
| TX432B Kit | transmitter exciter 432 MHz | 49.95 |
| TX432B W/T | same as above–wired & tested | 87.95 |
| TX150 Kit | 300 milliwatt, 2 mtr transmitter | 24.95 |
| TX150 W/T | same as above–wired & tested | 43.95 |

### POWER AMPLIFIERS



| | | |
|---|---|---|
| PA2501H Kit | 2 mtr power amp–kit 1w in–25w out with solid state switching, case, connectors | 69.95 |
| PA4010H Kit | 2 mtr power amp–10w in–40w out–relay switching | 69.95 |
| PA50/25 Kit | 6 mtr power amp, 1w in, 25w out, less case, connectors & switching | 59.95 |
| PA144/15 Kit | 2 mtr power amp–1w in–15w out–less case, connectors and switching | 49.95 |
| PA144/25 Kit | same as PA144/15 kit but 25w | 59.95 |
| PA220/15 Kit | similar to PA144/15 for 220 MHz | 49.95 |
| PA432/10 Kit | power amp–similar to PA144/15 except 10w and 432 MHz | 59.95 |

Blue Line . . . RF power amp, wired & tested, emission–CW-FM-SSB/AM

| Model | Band | Power Input | Power Output | |
|---|---|---|---|---|
| BLC 10/70 | 144 MHz | 10W | 70W | 149.95 |
| BLC 2/70 | 144 MHz | 2W | 70W | 174.95 |
| BLC 10/150 | 144 MHz | 10W | 150W | 269.95 |
| BLC 30/150 | 144 MHz | 30W | 150W | 249.95 |
| BLD 2/60 | 220 MHz | 2W | 60W | 164.95 |
| BLD 10/60 | 220 MHz | 10W | 60W | 169.95 |
| BLD 10/120 | 220 MHz | 10W | 120W | 269.95 |
| BLE 10/40 | 420 MHz | 10W | 40W | 159.95 |
| BLE 2/40 | 420 MHz | 2W | 40W | 189.95 |
| BLE 10/80 | 420 MHz | 10W | 80W | 289.95 |

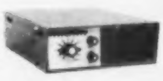
### POWER SUPPLIES

| | | |
|---|---|---|
| PS15C Kit | 15 amp–12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection. | 99.95 |
| PS15C W/T. | same as above–wired & tested. | 134.95 |
| PS25C Kit | 25 amp–12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection | 139.95 |
| PS25C W/T | same as above–wired and tested | 169.95 |
| PS25M Kit | same as PS25C with meters | 159.95 |
| PS25M W/T | same as above–wired and tested | 189.95 |
| O.V.P. | adds over voltage protection to your power supplies, 15 VDC max. | 14.95 |
| PS3A Kit | 12 volt–power supply regulator card with fold-back current limiting | 11.95 |
| PS3012 W/T | new commercial duty 30 amp 12 VD regulated power supply w/case, w/fold-back current limiting and overvoltage protection | 274.95 |

### REPEATERS

| | | |
|---|---|---|
| RPT50 Kit. | repeater–6 meter (less crystals) | 599.95 |
| RPT50 W/T | repeater–6 meter, wired & tested | 899.95 |
| RPT144 Kit | repeater–2 mtr–15w–complete (less crystals) | 599.95 |
| RPT220 Kit | repeater–220 MHz–15w–complete (less crystals) | 599.95 |
| RPT432 Kit | repeater–10 watt–432 MHz (less crystals) | 649.95 |
| RPT144 W/T | repeater–15 watt–2 mtr. | 899.95 |
| RPT220 W/T | repeater–15 watt–220 MHz. | 899.95 |
| RPT432 W/T | repeater–10 watt–432 MHz. | 949.95 |
| DPLA50 | 6 mtr close spaced duplexer | 680.00 |
| DPLA144 | 2 mtr, 600 KHz spaced duplexer, wired and tuned to frequency | 409.95 |
| DPLA220 | 220 MHz duplexer, wired and tuned to frequency | 409.95 |
| DPLA432 | rack mount duplexer | 379.95 |
| DSC-U | double shielded duplexer cables with PL259 connectors (pr.) | 29.95 |
| DSC-N | same as above with type N connectors (pr.) | 34.95 |

### TRANSCEIVERS



| | | |
|---|---|---|
| TRX50 Kit | Complete 6 mtr FM transceiver kit, 20w out, 10 channel scan with case (less mike and crystals). | 259.95 |
| TRX144 Kit | same as above, but 2 mtr & 15w out | 259.95 |
| TRX220 Kit | same as above except for 220 MHz | 259.95 |
| TRX432 Kit | same as above except 10 watt and 432MHz | 284.95 |
| TRC-1 | transceiver case only | 34.95 |
| TRC-2 | transceiver case and accessories | 54.95 |

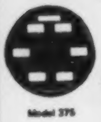
### SYNTHESIZERS

| | | |
|---|---|---|
| SYN II Kit | 2 mtr synthesizer, transmit offsets programmable from 100 KHz–10MHz, (Mars offsets with optional adapters). | 169.95 |
| SYN II W/T | same as above–wired & tested. | 239.95 |
| SYN 220 Kit | same as SYN II Kit except 220-225 MHz | 169.95 |
| SYN 220 W/T | same as above–wired & tested | 239.95 |

### OTHER PRODUCTS BY VHF ENGINEERING

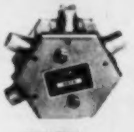
| | | |
|---|---|---|
| CD1 Kit | 10 channel receive xtal deck w/diode switching. | $ 8.95 |
| CD2 Kit | 10 channel xmit deck w/switch and trimmers | 16.95 |
| CD3 Kit | UHF version of CD1 deck, needed for 432 multi-channel operation. | 14.95 |
| COR2 Kit | carrier operated relay. | 23.95 |
| SC3 Kit | 10 channel auto-scan adapter for RX with priority | 21.95 |
| Crystals | we stock most amateur grade pairs from 146.0–147.0 (each) | 5.00 |
| CWID Kit | 159 bit, field programmable, code identifier with built-in squelch tail and ID timers | 42.95 |
| CWID | wired and tested, not programmed. | 59.95 |
| CWID | wired and tested, programmed | 64.95 |
| MIC I | 2,000 ohm dynamic mike with P.T.T. and coil cord | 13.95 |
| TS1 W/T | tone squelch decoder | 59.95 |
| TS1 W/T | installed in repeater, including interface accessories | 94.95 |
| TD3 Kit | 2 tone decoder | 39.95 |
| TD3 W/T | same as above–wired & tested | 64.95 |
| HL144 W/T | 4 pole helical resonator, wired & tested, swept tuned to 144 MHz ban | 34.95 |
| HL220 W/T | same as above tuned to 220 MHz ban | 34.95 |
| HL432 W/T | same as above tuned to 432 MHz ban | 34.95 |

**COAXIAL SWITCHES AND ACCESSORIES** for antenna selection and RF switching. These high-quality switches have set the standard for the industry for years. Ceramic switches with silver alloy contacts and silver-plated conductors give unmatched performance and reliability from audio frequencies to 150 MHz. B&W coaxial switches are designed for use with 52- to 75-ohm non-reactive loads, and are power rated at 1000 watts AM, 2000 watts SSB Connectors are UHF type. Insertion loss is negligible, and VSWR is less than 1.2:1 up to 150 MHz. Crosstalk (measured at 30 MHz) is 45 dB between adjacent outlets and -60 dB between alternate outlets.


Model 375

Model 376

Model 550A-2


Model 551A

Model 590G

Model 592

Model 595

Model 550A

Model 590

## COAXIAL SWITCHES AND ACCESSORIES

for antenna selection and RF switching

| Model | PRICE | Outputs | Remarks |
|---|---|---|---|
| 375 | 18.95 | 6 | PROTAX switch. Grounds all except selected output circuit. |
| 376 | 18.95 | 5 | PROTAX switch. Grounds all except selected output circuit. Sixth switch position grounds *all* outputs. |
| 550A | 14.00 | 5 | |
| 550A-2 | 12.50 | 2 | |
| 551A | 17.50 | 2 | Special 2-pole, 2-position switch used to switch any RF device in or out of series connection in a coaxial line. See figure (over). |
| 588 | .95 | – | Bracket only, for wall mounting of radial connector switches. |
| 590 | 17.95 | 5 | |
| 590G | 17.95 | 5 | Grounds all except selected output circuit. |
| 592 | 16.50 | 2 | |
| 595 | 18.50 | 6 | Grounds all except selected output circuit. |

B&W BARKER & WILLIAMSON, INC.

# INTRODUCES

**PI-DUX® Coils**
High-precision, air-wound coils for band-switching, pi-network final amplifiers.

Model 195-1 rated to 1 KW PEP
Model 195-2 rated to 2 KW PEP

**195 - 1 $48.50**
**195 - 2 $56.50**

Also . . .

**AIR-DUX® Air Wound Coils**
Uniform-pitch coils from ½ inch to 6 inches diameter, 2 inches to 10 inches long, 4 to 32 turns per inch, no. 8 to no. 24 AWG.

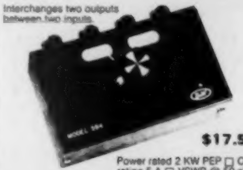
Typical air-dux coil.

**2 New Coaxial Switches for wall or desk mounting**
Model 593—Single pole, 3-position

**$16.75**

Grounds unused positions.

Model 594—DPDT
Interchanges two outputs between two inputs.



**$17.50**

Power rated 2 KW PEP ☐ Current rating 5 A ☐ VSWR @ 50 ohms—1.3:1 max. to 150 MHz ☐ Insertion loss and crosstalk negligible.

Model 331A transistor dip meter — Portable RF single generator, signal monitor, or absorption wavemeter. Lightweight (1 pound, 6 ounces with all coils), battery-powered unit is ideal for field use in testing transceivers, tuning antennas, etc. Can also be used to measure capacity, inductance, circuit Q, and other factors. Indispensable for experimenters, it is easily the most versatile instrument in the shop. Continuous coverage from 2 MHz to 230 MHz in seven ranges.

| | |
|---|---|
| Frequency Coverage: | 2 MHz to 230 MHz in 7 overlapping ranges by plug-in coil assemblies: 2 MHz–4 MHz, 4 MHz–8MHz, 8 MHz–16 MHz, 16 MHz–32 MHz, 32 MHz–64 MHz, 50 MHz–110 MHz, 110 MHz–230 MHz |
| Accuracy: | ±3% |
| Modulation: | 1000 Hz, 25% to 40% |
| Power: | 9-volt transistor battery, Burgess 2U6 or equivalent |
| Size: | 7" x 2¾" x 2¾" |
| Shipping Weight: | 1 lb., 6 oz. |
| Price: | $120.00 |

Model 372 CLIPREAMP. Get maximum legal modulation without danger of splatter.

| | |
|---|---|
| Input Impedance: | 100,000 ohms |
| Input Levels: | 5 millivolts to 20 millivolts |
| Voltage Gain: | 10 dB |
| Output Level: | 60 millivolts |
| Output Impedance: | 50,000 ohms |
| Power: | 9-volt transistor battery, Burgess 2U6 or equivalent |
| Size: | 2⅝" x 3" x 4½" |
| Shipping Weight: | 7 oz. |
| Connectors: | Terminal strip |
| Price: | $27.50 |

## PHONE PATCH

Universal hybrid coupler II phone patch. Model 3002W and model 3001W. The hybrid circuit provides for effortless VOX operation of the phone patch. A built-in Compreamp speech preamplifier/limiter (in Model 3002W) increases the level of weak phone signals and also prevents overmodulation when the local telephone is used as the station microphone. (The Compreamp also functions as a preamplifier/limiter with the station microphone, if desired.)

**Model 300 2W with Compreamp $125.00**
**Model 300 1W without Compreamp $85.00**

| | |
|---|---|
| Inputs from: | |
| Line | 600 ohms |
| Receiver | 4 ohms |
| Microphone | High impedance (50,000 ohms) crystal or dynamic |
| Tape Recorder | 4 ohms |
| Outputs to: | |
| Transmitter | 50,000 ohms |
| Receiver Speaker | 4 ohms |
| Tape Recorder | 0.5 megohm |
| Size | 6½" x 7½" x 3" |
| Shipping Weight | 3½ lbs. |
| Power | 9-volt battery, Burgess 2U6 or equivalent |
| Connectors | Phono |

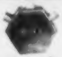
B&W

Model 333 dummy load wattmeter — Favorite Lightweight Portable—250 WATT RATING — Air Cooled. Ideal field service unit for mobile 2-way radio — CB, marine, business band. Best for QRP amateur use, CB, with zero to 5 watts full scale low power range.

| | |
|---|---|
| Frequency Range: | DC to 300 MHz |
| VSWR: | Less than 1.3:1 to 230 MHz |
| Power Range: | 250 watts intermittent |
| Wattmeter Ranges: | 0-5, 0-50, 0-125, 0-250 |
| Connector: | SO-239 |
| Size: | 4" x 7" x 6" |
| Shipping Weight: | 2 lbs. |
| Price: | $98.50 |

Model 374 dummy load wattmeter — Top of the Line — 1500 WATT RATING — Oil Cooled. Our highest power combination unit. Rated to 1500 watts input (intermittent). Meter ranges are individually calibrated for highest accuracy.

| | |
|---|---|
| Frequency Range: | DC to 300 MHz |
| VSWR: | Less than 1.3:1 to 230 MHz |
| Power Range: | 1500 watts DC intermittent. Warning light* signals maximum heat limit. |
| Wattmeter Ranges: | 0-15, 0-50, 0-300, 0-1500 |
| Input Connector: | SO-239 (hermetically sealed) |
| Size: | 4½" x 9" x 10½" |
| Shipping Weight: | 12 lbs. |
| Price: | $215.00 |



Coaxial antenna changeover relay. Model 377.

| | |
|---|---|
| Power Rating: | 1000 watts CW (2000 watts SSB) |
| VSWR: | Less than 1.15:1, DC to 150 MHz |
| Power Requirements: | 0.015 Ampere, 45 to 130 volts AC |
| Connectors: | UHF Type SO-239 |
| Dimensions: | 3½" x 1½" |
| Shipping Weight: | 1 lb. |
| Price: | $17.95 |

High Power — 1000 WATT RATING — Oil Cooled — model 334A dummy load wattmeter. Our most popular combination unit. Handles full amateur power. Meter ranges individually calibrated. Can be panel mounted.

| | |
|---|---|
| Frequency Range: | DC to 300 MHz |
| VSWR: | Less than 1.3:1 to 230 MHz |
| Power Range: | 1000 watts CW intermittent. Warning light* signals maximum heat limit. |
| Wattmeter Ranges: | 0-10, 0-100, 0-300, 0-1000 |
| Input Connector: | SO-239 (hermetically sealed) |
| Size: | 4½" x 9" x 10½" |
| Shipping Weight: | 12 lbs. |
| Price: | $174.00 |

Wide range attenuator — Model 371-1. Seven rocker switches provide attenuation from 1 dB to 61 dB in 1-dB steps. Switches are marked in dB, 1-2-3-5-10-20-20. Sum of actuated switches (IN position) gives attenuation. With all switches in OUT position, there is NO insertion loss. Attenuator installs in coaxial line using UHF connectors.

| | |
|---|---|
| Power Capacity: | ½ watt |
| VSWR: | 1.3:1 maximum, DC to 225 MHz |
| Impedance: | 50 ohms |
| Accuracy: | 1 dB/dB, DC to 60 MHz<br>0.1 dB/dB ±0.5 dB, DC to 180 MHz<br>0.1 dB/dB ±1.0 dB, DC to 225 MHz |
| Size: | 6½" x 2½" x 2⅝" |
| Shipping Weight: | 1½ lbs. |
| Price: | $49.50 |

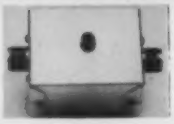
Model 359. Increase your transmitter's effective speech power up to four times. This two stage, transistorized Audio Preamplifier/Limiter can be used with all types of transmitters.

| | |
|---|---|
| Input Impedance | 100,000 ohms |
| Input Level | 5 millivolts to 20 millivolts |
| Voltage Gain | 10 dB |
| Output Level | 60 millivolts |
| Output Impedance | 50,000 ohms |
| Power | 9-volt transistor battery, Burgess 2U6 or equivalent |
| Size | 2⅝" x 3" x 4½" |
| Shipping Weight | 6½ oz. |
| Connectors | Terminal strip |
| Price | $37.50 |

2-meter mobile AT-200 Antenna Matcher. Use your cars AM/FM antenna for your 2-meter mobile rig. Tunes from the front panel for max. output, min. VSWR (1.2:1 or less for most car antennas). $24.95

# COAXPROBE®

ONLY
**$9.95**



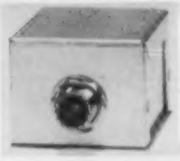
## COAXIAL RF PROBE FOR FREQUENCY COUNTERS AND OSCILLOSCOPES

***MONITOR YOUR SIGNAL DIRECTLY FROM THE COAX LINE**
***5-2000 WATTS PEP**
***OUTPUT: .31v-1.8v RMS 8-800 WATTS**
***INSERTION LOSS LESS THAN .2db (3-30 Mhz.)**
***USEFUL RANGE: .5 to 150 Mhz.**

Eliminate jerry-rigging when you need to monitor your signal. The CoaxProbe® will work on both frequency counters and oscilloscopes (of proper bandwidth). Just connect the probe into your coax line and hook up your test equipment. Because of its low loss, **you can leave it in while you operate!**

# LYTL-LOAD®

ONLY
**$8.95**



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## 30 WATT DUMMY LOAD FOR QRP AND 2-METERS

Now! A dummy load that's just the right size for low power work. Rated at 30 watts for 30 seconds, the Lytl-load® is perfect for Qrp work, 2-meters or any application where low power and small size are required. The Lytl-Load® has a range to 150 Mhz with SWR of 1.4:1 at 150 Mhz and 1.1:1 at 30 Mhz.

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# MAY SPECIALS

*BONUS: Extra 3% Discount on merchandise when order is accompanied by Cashier's Check or Money Order.*

| Tri-Band Beams | List | Spl |
|---|---|---|
| Mosley TA-33, 3 elements | $264.00 | 169.00 |
| Mosley CL-33, 3 elements | 304.75 | 194.00 |
| Hy-Gain TH3JR, Low Power | 149.95 | 109.50 |
| Hy-Gain TH3MK3, 3 elements | 229.95 | 169.00 |
| Hy-Gain TH6DXXX, 6 elements | 299.50 | 205.00 |
| **OTHER SPECIALS** | | |
| Cushcraft ARX-2 | 39.95 | 29.75 |
| Cushcraft A147-11 | 36.95 | 27.50 |
| Cushcraft A147-22 | 109.95 | 81.50 |
| Alliance HD-73 Rotor | 159.95 | 99.00 |
| Hustler—see March Issue of 73 | | |

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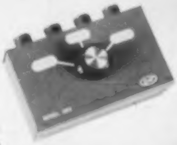
# new COAX SWITCHES
from Barker & Williamson



## Model 593

- ***Single Pole*** 3 Position with grounding of all unused positions
- ***Crosstalk*** (measured at 30 MHz) is -45db between adjacent outlets and 60 db between alternate outlets

## Model 594

- ***2 Pole 2 Position***
- ***Crosstalk*** 45db (measured at 30 MHz)

### Specifications for both switches

- ***Power*** 1 KW-2 KW PEP
- ***Impedence*** 50-75 ohms
- ***VSWR*** 1.2:1 up to 150 MHz
- ***Dimensions*** 1¾" high, 5" wide, 3" deep
- ***Weight*** 1 lb.
- ***Mount*** Wall or desk

✓B23 Available at your B&W dealer

B&W
Barker & Williamson, Inc.
10 Canal St. Bristol, Pa. 19007
Telephone: (215) 788-5581

---

# SST T-4
ULTRA TUNER DELUXE

ULTRA TUNER DELUXE Matches any antenna—coax fed or random wire on all bands (160-10 meters). Tune out the SWR on your antenna for more efficient operation of any rig. Home, mobile, portable—only 9"x2½"x5" • 300 watt RF **output** capability • **SWR meter** with 2-color scale • **Antenna Switch** selects between two coax fed antennas, random wire, or tuner bypass • Efficient **Airwound inductor** • 208 pf. 1000V. Capacitors • Attractive bronze finished enclosure.

**only $64.95**

## SST T-2 ULTRA TUNER

Tunes out SWR on any antenna—coax fed or random wire (160-10 meters). Any rig—up to 200 watts RF output. Rugged, yet compact: 5¼" x 2¼" x 2¼".

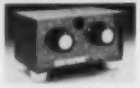
**only $37.95**

## SST T-3 MOBILE IMPEDANCE TRANSFORMER

Matches 52 ohm coax to the lower impedance of a mobile whip. Taps between 3 and 50 ohms. 3-30 MHz. 300 watts output. 2⅝"x2"x2¼".

**only$19.95**

## SST T-1 RANDOM WIRE ANTENNA TUNER



All bands (160-10 m.) with any wire • 200W **output** • Any transceiver • Home or portable • Neon tune-up indicator.

**only $29.95**

**SST DL-1 K4RLJ DUMMY LOAD.** 1000W PEP 1.5:1 1-225 MHz. Sealed. 3-1/8"x4-3/8".

**only $17.95**

**SST CL-1 24 HR. CLOCK.** Giant red **LED** numerals. Month and day also at push of button. Beautiful for your desk. 110VAC.

**only $22.95**

**SST B-1 BALUN** for balanced lines. 300W.

**only $5.00**

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**Guarantee:** All SST products are unconditionally guaranteed for 1 year. In addition, they may be returned within 10 days for a full refund (less shipping) if you are not satisfied for any reason.

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TX PWR
VOL-SQ
MHz
TX OFFSET

# 1979 FM-28!!

**25 WATTS**
**144-148 MHz**
**FULLY SYNTHESIZED**
**5 KHz STEPS**
**PROVISIONS FOR NON-STANDARD OFFSETS**
**AND ONLY $295.00**

Last year we promoted the FM-28 at $329.95 in an attempt to acquaint the 2 Meter FM gang with this superb transceiver. We never experienced such an enthusiastic response.

As a result of the great popularity of this radio we've been able to increase production, reduce our cost, improve reliability, and tighten specifications.

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# W2NSD/1
# NEVER SAY DIE
### *editorial by Wayne Green*

*from page 4*

initials of that club) mounted their second annual auction in Manchester just before Lincoln's birthday. Chancy time of year for something like this, as they found out last year when Mother Nature dumped a bunch of snow on New England the day before the auction, effectively keeping most everyone home.

The crowd was excellent this year, and the Roving Camera was there to catch all the action. The auction brought out tons of vintage ham gear for a yearly change of ownership. I haven't seen so many Gonset Communicators all in one place in years . . . I wonder what the new owners *do* with them?

Manchester is only 35 miles from Peterborough, but then, New Hampshire is a very small state and most towns are not very far apart. Sherry and I often drive up to Manchester for a business lunch or dinner. The shopping is good there, too, particularly since there is no sales tax in New Hampshire. After visiting other states, it feels funny to buy things and pay only the price marked.

There is a particularly good

CITY OF MANCHESTER PARKS & RECREATION

*The auction is held in an armory in downtown Manchester, a cavernous place.*

*Jeff DeTray, the assistant editor and publisher of 73 and* Kilobaud MICROCOMPUTING, *managed to contain himself through some of the more frantic bidding, returning with naught but pleasant memories of underbidding on equipment for which he would have no earthly use.*

*An excited mass of bidders, vying for every piece of gear, no matter how useless, is here letting its enthusiasm run away with itself over a particularly exotic rig.*

*Much of the crowd wandered off to visit the tables of ham gear brought in by dealers such as Tufts Electronics, a carpetbagger from Massachusetts—a state known to most New Hampshire people for the tons of beer cans brought up by thousands of world-famous Massachusetts drivers and dumped alongside New Hampshire roads on weekends. Here is aging, paunchy Wayne in the center, listening to John Seeney of Cushcraft tell why his new magnetic-mount two meter antenna is selling so well. John had a display set up in one corner of the Tufts booth and kept a lot of hams enthralled with his hyperbole.*

*Here's Chuck Martin WA1KPS trying to beat off the frantic buyers of ham gear. Actually, I'm not kidding about the auction doing well for some of the commercial exhibits. Tufts did their best day of the entire month in sales as a result of the sales made this day . . . lots of 520s found happy homes. Chuck, who would much rather be skiing, gave in to commercial pressures and brought a truckload of stuff to New Hampshire, thus ensuring more healthy signals from this relatively rare state.*

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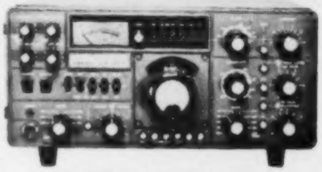

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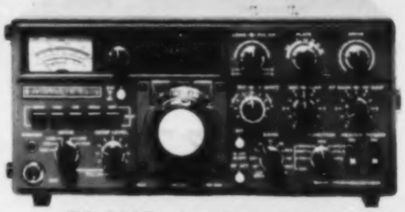

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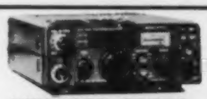
Deluxe 1.8 - 30 MHZ Transceiver

Call or write for special price!!!

NEW!



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10 or 25 Watt FM 2 meter xcvr synthesized with memory. **Get our best price!**

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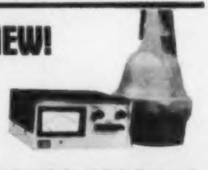

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HAM IV Rotor $\$147^{00}$

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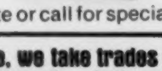
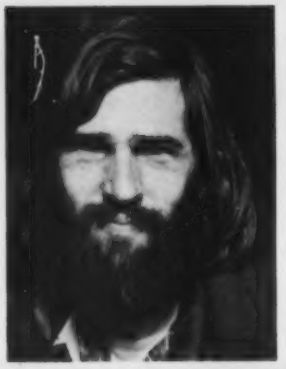


Write or call for special price.

**Sure, we take trades on new equipment! Call or write. We're Burning to Make "Hot" Deals!!**

*Over visiting, looking for microwave gear bargains, was Judson Snyder K2CBA, whom I've known for over 30 years. As a matter of fact, he used to bootleg with my ham rig before he got his own call. Jud is a big gun on UHF from the Troy area of New York.*



*This is Steve Murray K1KEC, who apparently lost his razor and scissors a few years ago. Steve is another skier, though he missed the yearly pilgrimage to Aspen this January. Steve has been deeply involved with repeater frequency coordination for about ten years.*

*A computer store from Boston had a display at the auction, attracting computerist Hal Chamberlin . . . one of the earliest publishers in the field. Hal put out* The Computer Hobbyist *from North Carolina before wising up and moving to New Hampshire. His work with cassette systems lives on in many of the commercial systems today. Hal, by the way, was one of the first people I contacted when I thought up the idea for starting* Byte *magazine. He didn't seem to think that a magazine would do well for microcomputers, so I next tried Hal Singer, another editor of an excellent hobbyist newsletter. He didn't think much of the idea either, so I tried Bob Albrecht, etc., finally getting down to the chap I eventually picked, Helmers. I understand that Helmers has been sort of "retired" by* Byte, *so perhaps those who turned down the job made a better decision for the long run.*

supermarket in Manchester, too—Ferretti's—so I stopped by and found they had some fresh Chinese noodles! Now, how often do you see those in a supermarket? A few days later I got busy and made up a batch of spareribs with black bean sauce on soft noodles. This is a dish which I always get when I visit Hong Fat restaurant in Chinatown in New York (63 Mott Street). It's so good, you can become addicted to it. Imagine my surprise when I found that I could make it even better than Hong Fat! It's easy, once you figure out how to do it.

Not to turn *73* into a cookbook, but there are a few dishes which I've learned to make which are first rate, if you are adventurous in your eating. Oh, you're not? Okay . . . forget it.

### SOFTWARE SURPRISE

One of the more pleasant surprises in the new software publishing business has been the sales of Instant Software's Ham Package I. This is a group of eight different programs for the Radio Shack TRS-80 microcomputer. These programs permit you to make most of the ordinary ham slide rule calculations quickly and easily—calculations such as Ohm's Law, frequency vs. reactance, series capacitances, parallel resistances, voltage dividers, etc. There are also programs which give you the dimensions for dipole and yagi antennas.

One of the more useful aspects of computerized calculations is the ability of the TRS-80 to draw the schematics of the circuits and antennas, complete with the dimensions.

With approximately 30% of the computer hobbyists also being radio amateurs, the sales of the Ham Package I programs were not expected to be low, but sales reports from Instant Software marketing show that this package of programs has consistently been one of the very best sellers. Only the Space Trek II and the Air Flight Simulator program packages have consistently been outselling the Ham Package! Space Trek II has been running about 40% ahead of the Ham Package, and Air Flight Simulator has been running about 15% ahead.

At $7.95 for the eight programs, the Ham Package has to be one of the better program values—and perhaps a harbinger of things to come as far as the publishing of programs in bulk is concerned. These are available from many of the computer stores, a few Radio Shack stores, and from Instant Software, Inc. A few ham stores are starting to set up computer program sales centers. Tufts Electronics is carrying the full line of Instant Software program packages.

### JANUARY WINNER

John Murray W1BNN was the overwhelming winner in our January Most Popular Article contest. He will be receiving a $100 bonus check for his article, "SOS! Ship in Trouble!"

### WE COOK, TOO!

*On the left is Lynn Panciera-Fraser, the production manager for both 73 and* MICROCOMPUTING *magazines. She's working with Sherry Smythe, our Executive Vice President, in making some Chinese steamed dumplings. I was not too busy making my spareribs with black bean sauce on soft Chinese noodles to snap this picture.*

## Ham Help

I need a schematic and/or manual for a Sideband Engineers model SBE33. I will pay for photocopying and shipping.

**Jeff Taylor W0NLU**
**R #1, Box 40A**
**St. James MO 65559**

I need help with the digital multimeter article authored by WA4AIH in the April, 1978, issue of *73*. I need the source for the General Instruments AY-3-3550 IC and the Intersil ICL 8052 ACPD.

**Ed McKenzie WA3PHL**
**Millersville State College**
**Millersville PA 17551**

# Social Events

*Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place.*

### SHREVEPORT LA
### MAY 4-5

The Shreveport Amateur Radio Association will hold its annual hamfest on May 4-5, 1979, at the Louisiana State Fairgrounds. Pre-registration is $3.00; $4.00 at the door. This is an ARRL sanctioned hamfest.

### NEENAH WI
### MAY 5

The 3-F Amateur Radio Club will hold its annual swapfest on Saturday, May 5, 1979, from 8:00 am to 3:00 pm, at the Neenah Labor Temple, 157 S. Green Bay Road, Neenah, Wisconsin, just off Highway 41 at the Highway 114 or 150 exit. Facilities include a large parking area and a large indoor swap area with a free auction at the end of the day. Food and beverage will be available. Advance admission for tickets and tables is $1.50; $2.00 at the door. Talk-in on 52/52. For reservations, write to Mark Michel W9OP, 339 Naymut Street, Menasha WI 54952.

### BINGHAMTON NY
### MAY 5

The Southern Tier NY Amateur Radio Clubs will hold their 20th annual hamfest and dinner on May 5, 1979, at the Lutheran Fellowship Recreation Center, 3.7 miles north of NY Rte. 17, Exit 71 N., on Stella Ireland Road, Binghamton, New York. There will be technical talks, prizes, displays, exhibits, refreshments, and free flea-market parking. Tickets are $2.00 for general admission and $7.00 for the banquet (including general admission). Inside tables are $5.00 each, by reservation only. For tickets and information, write to STARC, PO Box 11, Endicott NY 13760.

### DULUTH MN
### MAY 5

The Arrowhead Radio Amateur Club will hold its annual swapfest on May 5, 1979, from 11:00 am to 3:00 pm at the First United Methodist Church, 230 E. Skyline Parkway, Duluth, Minnesota. Admission is $1.50 and tables are $1.50. Refreshments are available on the grounds. An auction will be held at 2:00 pm. Talk-in on .34/.94. For more information, write Harold Simmerman N9AMA, Swapfest Chairman, Route 1, Box 7, Lake Nebagamon WI 54849, or call (715)-374-3231.

### DEKALB IL
### MAY 6

The Kishwaukee Radio Club and the DeKalb County Amateur Repeater Club will hold their 21st annual indoor/outdoor hamfest on Sunday, May 6, 1979, from 8:00 am to 3:00 pm at the Notre Dame School, 3 miles south of DeKalb between Highway 23 and South 1st St. on Gurler Rd., DeKalb, Illinois. Tickets are $1.50 in advance; $2.00 at the door. Indoor tables are available or you may bring your own. The outdoor setup is free. Talk-in on 146.13/.73 and 94. For tickets and directions, send an SASE to Howard Newquist WA9TXW, PO Box 349, Sycamore IL 60178.

### LOGANSPORT IN
### MAY 6

The Cass County Amateur Radio Club will hold its second annual hamfest on Sunday, May 6, 1979, from 7:00 am to 4:00 pm at the 4-H fairgrounds, Logansport, Indiana. Go north of Logansport on Highway 25, turn right at Road 100, and follow the QSY signs. Admission is $1.50 in advance and $2.00 at the gate. Outside setup is free and undercover setup is $1.00. Bring your own tables. There will be overnight camping, refreshments, ladies' bingo, and door prizes. Talk-in on 146.52 and Logansport repeater 147.78/.18. For information, write Dave Rothermel K9DVL, RFD 4, Box 146G, Logansport IN 46947.

### WARMINSTER PA
### MAY 6

The Warminster Amateur Radio Club will hold its fifth annual "Ham-Mart" flea market and auction on Sunday, May 6, 1979, from 9:00 am until 4:00 pm, at the William Tennent Intermediate High School, Street Road (Route 132), two miles east of York Road (Route 263), Warminster, Bucks County, Pennsylvania. A registration fee of $1.00 per car includes one ticket for door prizes. Tailgating is $2.00 additional. Indoor tables are available for $3.00 each. Talk-in on 146.16/76 and 146.52. For further information, please write Horace Carter K3KT, 38 Hickory Lane, Doylestown PA 18901, or phone (215)-345-6816.

### SACRAMENTO CA
### MAY 6

The North Hills Radio Club, Inc., of the greater Sacramento area, is having their 7th annual Ham Swap on Sunday, May 6, 1979, from 9:00 am until 3:00 pm at the Machinists Hall, 3081 Sunrise Blvd., Rancho Cordova, California. Take Hwy. 50 to Sunrise, turn left, and go to the signs. For information, write Cecilia Pringle WB6PBS, Publicity Chairman, North Hills Radio Club, PO Box 701, Fair Oaks CA 95628.

### ELLICOTT CITY MD
### MAY 6

The Potomac Area VHF Society will hold its eighth annual hamfest on Sunday, May 6, 1979, from 8:00 am to 5:00 pm at the Howard County Fairgrounds, approximately 15 miles west of Baltimore, at the intersection of I-70 and Rte. 32, Ellicott City, Maryland. A registration fee of $3.00 includes flea market or tailgate sales. Professional food and beverage catering and unlimited parking will be available. Talk-in on .52. For further information, contact Paul H. Rose WA3NZL, 25116 Oak Dr., Damascus MD 20750.

### IRVINGTON NJ
### MAY 6

The Irvington Radio Amateur Club will hold its annual hamfest on May 6, 1979, from 9:00 am to 4:00 pm at the PAL Building, 285 Union Ave., Irvington, New Jersey. Take the Garden State Parkway to Exit 143 north or 143A south. There will be refreshments and prizes. Tables are $3.00. Talk-in on .34/.94 and .52. For information, contact Ed Surmaitis WA2MYZ at (201)-687-3240 evenings, or write to Irvington Radio Amateur Club, 285 Union Ave., Irvington NJ 07111.

### FRESNO CA
### MAY 11-13

The 37th annual Fresno Hamfest will be held on May 11-13, 1979, at the Sheraton Inn, Clinton and Highway 99, Fresno, California. The program includes technical talks, swap tables and flea market, transmitter hunt on 2 meters (146.52), QLF contest, ARRL CD appointees meeting, ARRL-FCC forum, commercial exhibits, prizes, eyeball QSOs, prime rib banquet, and more. For full registration and eligibility for pre-registration prize, send in $17 before April 27, 1979; it's $19 and no pre-registration prize after that date. Talk-in on 146.34/146.94. For more information, contact the Fresno Amateur Radio Club, Inc., PO Box 783, Dept. HF, Fresno CA 93712.

### DEERFIELD NH
### MAY 12

The Hosstraders Net will hold its 6th annual tailgate swapfest on Saturday, May 12, 1979, at the Deerfield Fairgrounds, Deerfield, New Hampshire. There will be covered buildings, in case of rain. Admission is $1.00, with no commission or percentage. Commercial dealers are welcome at the same rate. Excess revenues will benefit the Boston Burns Unit of the Shriners' Hospital for Crippled Children. Last year we donated over $1100.00. Talk-in on .52 and 146.40-147.00. For more information, send an SASE to Joe DeMaso K1RQG, Star Route, Box 56, Bucksport ME 04416, or Norm Blake WA1IVB, PO Box 32, Cornish ME 04020, or check the Hosstraders Net on Sundays at 4:00 pm on 3940 kHz.

### VANCOUVER WA
### MAY 12-13

The Fort Vancouver Hamfair will be held on Saturday and Sunday, May 12-13, 1979, at Clark County Fairgrounds, Vancouver, Washington. Registration is $4.00 per person, which includes a drawing ticket. Tickets are also available at the door. Activities will include contests, seminars, commercial and amateur displays, family events and a large ham radio flea market. Many prizes will be awarded, with the grand prize being an Icom IC-701 HF transceiver and power supply. The fairground facilities include trailer parking and ample car parking. A catered buffet dinner is scheduled for Saturday night, with musical entertainment included. Price of the dinner ticket is $5.00 for adults. For registration, contact Ken Westby W7DYX, Registration Chairman, 606 Miami Court, Vancouver WA 98664.

### DAYTONA BEACH FL
### MAY 12-13

The Daytona Beach Amateur Radio Association, Inc., will hold its first hamfest on May 12-13, 1979, at the Holiday Inn Surfside, Daytona Beach, Florida. For Mom and the kids, there is the "drive-on" ocean beach, and shopping in the oceanside plaza. Advance registration is $3.00 per family and $3.50 at the door. For more details, contact Funfest chairman David Rusler WA4ZTT, 1725 Hope Drive, Ormond Beach FL 32074.

### SALINE MI
### MAY 13

The ARROW Repeater Association will hold its annual Swap and Shop on Sunday, May 13, 1979, at the Saline, Michigan, fairgrounds. Admission, including parking on the fairgrounds, is $1.50 in advance and $2.00 at the door. There will be food, prizes, and a covered area for trunk sales, as well as indoor tables. Because of Mother's Day, wives will be given free admission. Talk-in on 146.37/97, 223.18/224.78, and 448.5/443.5 MHz. For additional details, write ARROW, PO Box 1572, Ann Arbor MI 48106, or call George Raub AD8X at (313)-485-3562.

### WAUKESHA WI

**MAY 13**

The Milwaukee UHF Society, Inc., will hold its second annual Spring Swapfest on Sunday, May 13, 1979, starting at 7:00 am on the grounds of the Waukesha County Exposition Center, Waukesha, Wisconsin. There will be prizes and refreshments. Admission is $1.50 in advance and $2.00 at the gate. Some indoor space is available. Dealers and exhibitors are welcome. For information, write Swapfest, Box 49, North Prairie WI 53153. Please include an SASE.

### CADILLAC MI

**MAY 19**

The Wexaukee ARA will hold its 19th annual swap and shop on Saturday, May 19, 1979, from 9:00 am until 4:00 pm at the National Guard Armory, 415 Haynes Street, Cadillac, Michigan. Tickets are $2.00. There will be free parking and lunches available. Talk-in on 146.37/.97. For more information, contact Robert Bednarick WD8RZL, Publicity Director, Wexaukee ARA, Cadillac MI 49601.

### BENSENVILLE IL

**MAY 19**

The Radio Amateur Megacycle Society will hold its third Antenna Measuring Contest on Saturday, May 19, 1979, starting at 10:00 am on the grounds of the Flick-Reedy Corporation, corner of Thorndale and York Roads, Bensenville, Illinois. Equipment will be available to measure the gain and swr of 2 meter, 1¼ meter, and 70 cm antennas. Equipment for higher frequencies will be brought if advance request is made. Prizes will be awarded for the highest-gain antenna in each category. Refreshments will also be sold. For further details, including directions, write Joe LeKostaj WB9GOJ, 2558 N. McVicker Ave., Chicago IL 60639. Please enclose an SASE.

### BIRMINGHAM AL

**MAY 19-20**

The Birmingham Amateur Radio Club, Inc., will hold its Birminghamfest '79 and Alabama State Convention on May 19-20, 1979, at the Birmingham-Jefferson Civic Center Exhibition Hall, Interstate 20/59 at 22nd Street north (downtown Birmingham, 3 minutes from the airport). There will be air-conditioned exhibit space and an indoor air-conditioned flea market. Tentative forums are planned on a wide range of topics, from ARRL to microprocessors. Meetings will include MARS, ARRL, Alabama section nets/ARPSC, and others. On-site FCC exams will be administered on Saturday morning. Prizes include a Drake TR/DR-7 solid-state transceiver, a Kenwood TS-820, and a Drake UV-3 (complete). There will be a banquet on Saturday night at the Exhibition Hall, with special guest entertainer Jerry Clower. Family activities include games, movies, and bus tours of area sights. For information, contact Birminghamfest '79, PO Box 603, Birmingham AL 35201.

### DURHAM NC

**MAY 19-20**

The Durham F.M. Association will hold its annual Durhamfest on Saturday and Sunday, May 19-20, 1979, at the South Square Mall, Durham, North Carolina. Plenty of prizes, exhibits, and programs will be offered, and the XYLs can enjoy shopping. Ladies' bingo will be held on Sunday. Free tailgating spaces, under a covered, drive-in-and-sell flea market, come with a one-time $3.00 general registration ticket, with vendors and dealers included. Electrical power will be available. Harmonics and unlicensed XYLs are admitted free. Talk-in on 147.825-.225, 146.34-.94, 222.34-3.94. For more information, write DFMA, Box 8651, Durham NC 27707.

### BURLINGTON KY

**MAY 20**

The Kentucky Ham-O-Rama will be held on May 20, 1979, at the Boone County Fairgrounds, Burlington, Kentucky, For easy access, take the Burlington exit off I-75 south. There will be a chance for prizes included with the $3.00 gate ticket. There will also be hourly drawings, exhibits, a flea market, and refreshments. Talk-in on 146.19/79 and 52/52. For more information, contact NKARC, Box 31, Ft. Mitchell KY 41017.

### WEBSTER MA

**MAY 20**

The Eastern Connecticut Amateur Radio Club will sponsor an electronics flea market from 9:00 am until 6:00 pm, with an auction at 1:00 pm, on May 20, 1979, at Point Breeze Restaurant, Webster, Massachusetts. It will be held rain or shine. For more information and flyers, contact Richard Spahl K1SYI at (617)-943-4420 after 8:00 pm.

### EASTON MD

**MAY 20**

The fifth annual Easton Amateur Radio Society Hamfest will be held on May 20, 1979, from 10:00 am to 4:00 pm, at the Easton Senior High School cafetorium on Rt. 50, just south of Easton at mile marker 66. From the Baltimore or DC areas, go across the Chesapeake Bay bridge; the mile marker is about 27 miles from the bridge. There will be hamfest signs on Rt. 50, north and south. Refreshments will be available. There will be a donation of $2.00 with an additional $2.00 for tables or tailgaters. Talk-in on 52 and 146.445/147.045. For more information, write Charles C. Walgren WA3ZWX, Box 7, Trappe MD 21673, or the Easton Amateur Radio Society, Inc., Box 781, Easton MD 21601.

### TRENTON TN

**MAY 20**

The Humboldt ARC will hold its annual hamfest on Sunday, May 20, 1979, at Shady Acres City Park, Trenton, Tennessee. There will be a flea market, prizes, ladies' activities, and food. For further information, contact Ed Holmes W4IGW, 501 N. 18th Ave., Humboldt TN 38343.

### EVANSVILLE IN

**MAY 20**

The Tri-State Amateur Radio Society will hold its annual hamfest on May 20, 1979, at the Vanderburgh 4-H Rural Center, Evansville, Indiana. Grounds for the hamfest will be open at 8:00 am CST Sunday morning. There will be no admission charge. Tickets will be on sale for door prizes, which are a Kenwood 520S and a Yaesu 227R. In addition, there will be many other lesser prizes awarded for hamfest attendance. Exhibit tables inside the hall will be $2.50 each, and a 4-by-8-foot space in a covered area adjacent to the hamfest will be available for $1.00 per space. Food and beverage will be available. Saturday overnight camping space is available for those so equipped. Talk-in on .75/.15 through the Evansville repeater.

### STIRLING NJ

**MAY 20**

The Tri-County Radio Association will hold its annual indoor hamfest/flea market on May 20, 1979, at the Passaic Township Youth Center, Valley Road, Stirling, New Jersey, from 10:00 am to 5:00 pm. Admission is $2.00 and tables are $5.00. Among the many door prizes will be a Tempo S1 and a fully-synthesized 2 meter transceiver. Talk-in on 147.855/.255 or 146.52. For information, write Tri-County Radio Association, Box 412, Scotch Plains NJ 07076, or call Herb Klawunn at (201)-647-3461.

### CROWNSVILLE MD

**MAY 20**

The Maryland Mobileers Amateur Radio Club, Inc., will hold its annual hamfest on May 20, 1979, at Camp Barrett, Crownsville, Maryland, just west of Annapolis. The gates will open at 10:30 am. Tickets are $3.00. Prizes will be awarded. Talk-in on 146.52 and 146.10/.70. For information, contact MMARC, Inc., PO Box 784, Severna Park MD 21146.

### ROCHESTER NY

**MAY 25-27**

The 46th annual Rochester Hamfest and the New York State ARRL Convention will be held on May 25-27, 1979, at the Monroe County Fairgrounds, Route 15A, Rochester, New York. Advance registration is $3.75; registration at the gate is $4.00. The Saturday evening annual awards banquet tickets are $9.50 each. Unlimited outdoor flea market space is available at $1.00 per parking space. It will open at noon on Friday and operate until closing on Sunday. The indoor flea market space is $5.00 per table per day and is open Saturday and Sunday only. A limited number of camper hookups are available free on a first-come, first-served basis. Commercial exhibits and most programming is located at the Dome Center and will open at 8:30 am Saturday. FCC tests for Technician and higher classes will also begin at 8:30 am on Saturday at the fairgrounds. The ladies' shopping tour and program are free, but all must have a registration ticket. Children under 12 are also admitted free. For information, write Rochester Hamfest, PO Box 1388, Rochester NY 14603, or phone (716)-424-1100. For tickets, write Rochester Hamfest —Tickets, 737 Latta Rd., Rochester NY 14612.

### PORTLAND ME

**MAY 26**

The Portland Amateur Wireless Association and the University of Southern Maine Radio Club will hold a tailgate flea market on May 26, 1979, from 9:00 am to 5:00 pm on the campus of the University of Southern Maine, Portland, Maine. Admission is one dollar. Food will be available. Talk-in on 146.73 and 146.52. For further details, contact John Taylor N1SD, 44 Mitton St., Portland ME 04102, or phone (207)-773-2651.

### HAMBURG PA

**MAY 27**

The Reading Radio Club will

hold its annual hamfest on Sunday, May 27, 1979, beginning at 9:00 am, at the Hamburg Field House in Hamburg, Pennsylvania. There will be door prizes, food, tailgate sales, and dealer space available. The hamfest will be held rain or shine. Talk-in on .31/.91 and 146.52. For more information, write The Reading Radio Club, Hamfest Committee, PO Box 124, Reading PA 19603.

### SALEM VA
**MAY 27**

The Roanoke Valley Amateur Radio Club will hold its annual hamfest on Sunday, May 27, 1979, at the American Legion Building, Apperson Drive, ½ mile west of the intersection of South 11 and 419, Salem, Virginia. There will be fine prizes, including a first prize of a Ten-Tec 540 transceiver. Inside flea market tables are $3.00 and tailgaters are $2.00. Tickets are $2.00 each or 3 for $5.00 in advance. All tickets are $2.50 at the door. Talk-in on 146.88, 146.985, and 146.52. For advance tickets, send an SASE to George Moore WA4GFX, 701 Apperson Drive, Salem VA 24153.

### LOUISVILLE KY
**JUN 29-JUL 1**

The Louisville Area Computer Club will hold its 4th annual Computerfest™ 1979 from June 29 through July 1, 1979, at the Bluegrass Convention Center, Louisville, Kentucky. Activities include a flea market, seminars, and exposition, as well as activities for the entire family. Seminar and exposition admission is $4.00. Pre-registered Ramada Inn guests ($29.00, single; $34.00, double) receive free admission. For advance mail information, write Computerfest '79, Louisville Area Computer Club, PO Box 70355, Louisville KY 40270, or phone Tom Eubank, Chairman, at (502)-895-1230.

### UPPER HUTT NZ
**JUN 1-4**

The 1979 Annual Conference of the New Zealand Association of Radio Transmitters will be held on June 1-4, 1979, at Upper Hutt, New Zealand. Visitors are welcome to attend this conference. For registration forms, contact the Secretary, 1979 Conference Committee, PO Box 40-212, Upper Hutt NZ.

### ST. PAUL MN
**JUN 2**

The North Area Repeater Association, Inc., will hold its Amateur Fair '79 on Saturday, June 2, 1979, at the Minnesota State Fairgrounds, St. Paul, Minnesota. This is a swapfest and exposition for amateur radio operators and computer hobbyists. There will be free overnight parking for self-contained campers on June 1st only. You may sell from your car in the giant flea market or from the available inside space. There will be AMSAT and microprocessor exhibits, FCC, ARRL, Minnesota Repeater Council booths, and many prizes. Admission is $2.00. For information or reservations for commercial space, write Amateur Fair, PO Box 30054, St. Paul MN 55175.

### WENATCHEE WA
**JUN 2-3**

The Apple City Amateur Radio club will hold its Ham Fest on June 2-3, 1979, at Rocky Reach Dam, 7 miles north of the city on Highway 97, Wenatchee, Washington. Registration fee for amateurs is $3.00 (which includes one ticket for the prize drawing), $1.00 for non-amateurs, and children under 12 are free. A banquet dinner will be held on Saturday night at $5.00 per person. Free camp/trailer space will be provided at the park. Featured will be equipment displays, a VHF tune-up clinic, an arts and crafts show/sale, a swap shop, a photography display, exhibits, a tour of the Power House, a film on the Life of Thomas Edison, and a potluck dinner on Sunday at 1:00 pm. For information and reservations, contact the Apple City Amateur Radio Club, 713 Grandview Avenue, Wenatchee WA 98801.

### MANASSAS VA
**JUN 3**

The Ole Virginia Hams Amateur Radio Club, Inc., will hold its annual hamfest on June 3, 1979, at the Prince William County Fairgrounds, located ½ mile south of Manassas, Virginia, on Rte. 234. Gates will open at 8:00 am but tailgaters may enter at 7:00 am. General admission is $3.00 per person, with children under 12 admitted free. Tailgating is $2.00 per vehicle, with over 300 spaces available. Prizes include a 5-band SSB transceiver, a synthesized 2 meter transceiver, and a Bird 43 wattmeter, plus many more. Breakfast and lunch are available on the premises. Featured will be an FM clinic, a YL program, a children's program, CW proficiency, and QSL bureau programs. Indoor exhibit space for dealers and manufacturers is available. For information, write to Sam Lebowich WB4HAV, OVHARC, PO Box 1255, Manassas VA 22110.

### WEST HUNTINGTON WV
**JUN 3**

The Tri-State ARA will hold its 17th annual hamfest and family picnic on June 3, 1979, starting at 10:00 am, at the Camden Amusement Park, West Huntington, West Virginia. There will be a planned program for the XYL and kids, or you can enjoy the amusement park if you prefer. There is a possibility the FCC will administer amateur exams. There will be major prizes, a large flea market, exhibitors, and displays. Dealers are always welcome to space in the covered pavilion. Talk-in on 34/94 or 16/76. For more information, write TARA, PO Box 1295, Huntington WV 25715.

### ISLIP LI NY
**JUN 3**

The Long Island Mobile Amateur Radio Club, Inc., will hold its Long Island Hamfair '79 on June 3, 1979, from 9:00 am to 4:00 pm at the Islip Speedway, on Islip Avenue (Rte. 111), just one block south of the Southern State Parkway, Exit 43, or south on 111 from Exit 56 of the Long Island Expressway, Islip, Long Island, New York. There will be over 250 exhibitors. General admission is $1.50 and exhibitors' admission is $3.00 per space. Wives, sweethearts, and children under 12 are admitted free. There will be many door prizes available for all ticket holders. Talk-in on 146.25/.85 and .52. The rain date will be June 10, 1979. For information, contact Henry Wener WB2ALW, 53 Sherrard St., East Hills NY 11577, or phone (516)-829-5880 days or (516)-484-4323 nights.

### STEVENS POINT WI
**JUN 3**

The Central Wisconsin Radio Amateurs, Ltd., will hold its swapfest picnic on Sunday, June 3, 1979, starting at 10:00 am at Bukolt Park, Stevens Point, Wisconsin. There will be a picnic area, refreshments, equipment sales, and prizes. For information, write to Frank L. Guth W9BCC, Secretary-Treasurer, Central Wisconsin Radio Amateurs, Ltd., 1632 Ellis Street, Stevens Point WI 54481.

### PRINCETON IL
**JUN 3**

The Starved Rock Radio Club will hold its annual hamfest on Sunday, June 3, 1979, at the Bureau County Fairgrounds, Princeton, Illinois. The fairgrounds are centrally located and easily reached via routes 80-6-34-89-26. Watch for the large yellow "Hamfest" signs. There will be lots of room for the free swappers' area and parking. New equipment dealers, manufacturers, and their representatives are invited to request details on reserving space in our inside display area. There will be food and refreshments available during the day. Camper, van, and trailer spaces are available for a nominal fee and should be reserved in advance. Please include an SASE for map, motel information, and advance reservations at $1.50, if postmarked before May 20 ($2.00 at the gate). For more information, write W9MKS/WR9AFG, Starved Rock Radio Club, RFD #1, Box 171, Oglesby IL 61348, or phone (815)-667-4614.

### CHELSEA MI
**JUN 3**

The Chelsea Swap 'n Shop will be held on Sunday, June 3, 1979, at the Chelsea Fairgrounds, Chelsea, Michigan. Gates will open for sellers at 5:00 am and for the public from 8:00 am until 3:00 pm. Admission is $1.50 in advance or $2.00 at the gate. Children under twelve and non-ham spouses are admitted free. Talk-in on 146.52 and 146.37/.97. Proceeds will benefit the Dexter High School Radio Club and the Chelsea Communications Club.

### ALLENWOOD PA
**JUN 3**

The 8th annual Milton Amateur Radio Club Hamfest will be held on June 3, 1979, rain or shine, at the Allenwood Firemen's Fairgrounds, located on US Rte. 15, 4 miles north of Interstate 80, Allenwood, Pennsylvania. Hours are from 8:00 am to 5:00 pm. Registration for sellers is $2.50 advance or $3.00 at the gate. XYLs and children are free. Featured will be a flea market, an auction, a contest, cash door prizes, a free portable and mobile FM clinic, and supervised children's activities. There will be an indoor area available, plus food and beverages. Talk-in on .37/.97, .34/.94, and .52. For further details, call or write Kenneth Hering WA3IJU, RD #1, Box 381, Allenwood PA 17810, or phone (717)-538-9168.

### BEMIDJI MN
**JUN 9**

A hamfest will be held on June 9-10, 1979, at Bemidji Fairgrounds, on the west side of town on Highway 2, Bemidji, Minnesota. There will be a complete program for hams, non-hams, and kids. Camping will be available on Saturday night. Tables are available at no charge. Tickets are $1.50. Talk-in on 146.34/.94 and 3935. For more information, write Jerry Pottratz WB0MSH, Rte. 2, Box 239B, Bemidji MN 56601.

### MEADVILLE PA
**JUN 9**

The Crawford Amateur Radio Society will hold its fifth annual hamfest on Saturday, June 9, 1979, at Crawford County Fairgrounds, Meadville, Pennsylvania. Admission is $2.00. Gates will open at 8:00 am. Bring your own tables. The cost to display is $2.00 for an inside area and $1.00 for an outside area. There will be door prizes, refreshments, and commercial displays. Talk-in on .04/.64, .81/.21, .63/.03. For details, write CARS, Hamfest Committee, PO Box 653, Meadville PA 16335.

### GUELPH ONT CAN
#### JUN 9

The Central Ontario Amateur Radio Flea Market will be held on Saturday, June 9, 1979, from 8:00 am until 4:00 pm at Centennial Arena, College Ave. W., Guelph, Ontario, Canada. Commercial displays will open at 10:00 am. Admission is 75¢ per person with children 12 years and under admitted free. Admission for vendors is an additional $2.00. There will be a large indoor and outdoor flea market, commercial exhibits, free balloons, free handouts, and operating ham stations. Talk-in on .52/.52, .37/.97 VE3KSR, and .96/.36 VE3ZMG.

### SENATOBIA MS
#### JUN 9-10

The fourth annual Tri-State Hamfest will be held on June 9-10, 1979, in the coliseum of Northwest Junior College, Senatobia, Mississippi. Indoor air-conditioned space will be available for manufacturers, dealers, and distributors. For information, contact Joel P. Walker, 1979 Hamfest Chairman, PO Box 276, Hernando MS 38632; (601)-368-5277.

### AKRON OH
#### JUN 10

The Goodyear Amateur Radio Club will hold its 12th annual hamfest picnic and flea market on Sunday, June 10, 1979, from 10:00 am to 5:00 pm at Goodyear Wingfoot Lake Park, near Rtes. 224 and 43, east of Akron, Ohio. There will be five main prizes, including a Yaesu FT-101ZD, a Midland 13-510, a Wilson Mark II, a Drake MN-4C, and a Bird wattmeter. Featured will be a large flea market, auction, and picnic area. Tickets are $3.00 each or two for $5.00. Talk-in on 146.04/.64. For more information, contact D. W. Rogers WA8SXJ, 161 South Hawkins Ave., Akron OH 44313.

### MONROE MI
#### JUN 10

The Monroe County Radio Communication Association will hold its annual hamfest Swap and Shop on June 10, 1979, from 8:00 am to 4:00 pm at the Monroe County Community College on Raisinville Rd. off M-50, Monroe, Michigan. Donation is $1.00 at the gate. There will be plenty of free parking, free trunk sales and indoor table space. Features will include a contest, an auction, commercial displays, and UHF, VHF, and HF technical sessions and demonstrations. Talk-in on 146.13/.73 or .52. For reservations and information, contact Fred Lux WD8ITZ, PO Box 982, Monroe MI 48161.

### OAK RIDGE TN
#### JUN 14-15

The Oak Ridge Amateur Radio Club will hold the Oak Ridge Amateur Radio Convention and Hamfest '79 on July 14-15, 1979, at the Oak Ridge Civic Center, Oak Ridge, Tennessee. Admission is $1.00. There will be commercial and flea market exhibitors. FCC exams will be given on Saturday at 8:00 am. Features for the ladies and kids include movies, a tour of the Museum of Science and Energy, or the pool, picnic, and playgrounds at the Civic Center. Camping facilities, motels, and restaurants are conveniently located. The week of July 9-16 will be proclaimed Amateur Radio Week in Oak Ridge by the Mayor. Talk-in on 146.88, 147.72, and 146.82. Local talk-in on 146.52. Anyone interested should contact Charles Byrge WB4OBE, PO Box 291, Oak Ridge TN 37830.

### DUNELLEN NJ
#### JUN 16

The Raritan Valley Radio Club will hold its eighth annual hamfest on Saturday, June 16, 1979, from 8:00 am to 4:30 pm at Columbia Park, Dunellen, New Jersey. For details, write Raritan Valley Radio Club, RD 3, Box 317, Somerset NJ 08873, or phone WB2MNE at (201)-356-8435.

### MIDLAND MI
#### JUN 16

The Central Michigan Amateur Repeater Association will hold its fifth annual Swap & Shop on June 16, 1979, at the Midland County Fairgrounds, Midland, Michigan. There will be computer demonstrations and door prizes. Donation is $2.50 at the door. Talk-in on 146.73 WR8ARB and 146.52. For tickets and information, send an SASE to R. L. Wert W8QOI, 309 E. Gordonville Road, R #12, Midland MI 48640.

### CROWN POINT IN
#### JUN 17

The Lake County Amateur Radio Club will hold its 16th annual Dad's Day Hamfest on June 17, 1979, from 8:00 am until 5:00 pm at the Lake County Fairgrounds, Crown Point, Indiana. The event is all indoors. Donation is $1.50 in advance and $2.00 at the door. Table space is available on a first-come, first-served basis. There will be refreshments, a picnic area, ample parking, and a zoo and playground area for the children. Talk-in on 147.84/.24. For information and advanced tickets, write LCARC, PO Box 1909, Gary IN 46409.

### BARNESVILLE PA
#### JUN 17

The Schuylkill Amateur Repeater Association will hold its 2nd annual hamfest on Sunday, June 17, 1979, at Lakewood Park, Barnesville, Pennsylvania, along Rte. 54, 3 miles east of Exit 37E on Interstate 81. Gates open at 9:00 am, rain or shine. Registration is $2.00, with XYL and children free and tailgaters $1.00 additional. Indoor tables are available at $2.00 per table. There will be large indoor and outdoor display areas, prizes, plenty of parking space, amusement rides, picnic tables, and refreshments. Talk-in on 147.78/.18 and 146.52. For more information, write SARA Hamfest, PO Box 901, Pottsville PA 17901.

### TORRINGTON CT
#### JUN 17

The CQ Radio Club will hold its first flea market, rain or shine, on June 17, 1979, at the Torrington Fish and Game, Torrington, Connecticut. Undershelter tables, tailgate space, light lunches, a raffle, and a YL bake sale will be featured. Talk-in on 147.84/.24 and 146.52. For information, contact Bob W1FHP at (203)-266-7232, Ed W1JSU at (203)-482-1837, Everett K1AQE at (203)-482-0523, or write Dave Johnstone WB1COB, 19 Margerie St., Torrington CT 06790, or phone (203)-482-7348.

### BELLEFONTAINE OH
#### JUL 1

The Champaign Logan Amateur Radio Club, Inc., will hold its annual hamfest on Sunday, July 1, 1979, at the Logan County Fairgrounds, South Main Street and Lake Avenue, Bellefontaine, Ohio. There will be free admission and door prizes. Trunk and table sales are $1.00, and there will also be a bid table. Talk-in on 146.52. For more information, contact John L. Wentz W8HFK, Box 102, West Liberty OH 43357, or Frank Knull W8JS, 402 Lafayette Ave., Urbana OH 43078.

### DUNKIRK NY
#### JUL 1

The Northwestern New York Repeater Association and the Northern Chautauqua Amateur Radio Club will hold their Lake Erie International Hamfest on Sunday, July 1, 1979, at the fairgrounds in Dunkirk, New York. A large flea market area and plenty of free parking will be provided. Tickets are $4.00 at the gate or $3.00 in advance. RV hookups are available. For information on advance sales or for a map showing easy directions from I-90, write to Dick Brinkerhoff WB2HEF, 123 5th St., Dunkirk NY 14048.

### INDIANAPOLIS IN
#### JUL 8

The Indianapolis Amateur Radio Association will sponsor the Indianapolis Hamfest on Sunday, July 8, 1979, at the Marion County Fairgrounds, on the southeast corner of Indianapolis at the intersection of Interstates 74 and 465, Indianapolis, Indiana. There will be commercial exhibitors and dealer displays for a fee of $30.00 per booth. The commercial building will be open from 12:00 noon until 9:00 pm on Saturday and will reopen at 7:00 am on Sunday. Camper hookup facilities are available on the fairgrounds for overnight parking if you arrive on Saturday. A food and drink vendor will have a setup outside, while a professional caterer will have facilities inside. For more information, write to the Indianapolis Hamfest, PO Box 1002, Indianapolis IN 46206.

### CANTON OH
#### JUL 15

The fifth annual Hall of Fame Hamfest will be held on Sunday, July 15, 1979, at Stark County Fairgrounds, Canton, Ohio. Tickets are $2.50 in advance and $3.00 at the gate. Mobile check-in on .19/.79 or .52/.52. For information, contact Max Lebold WA8SHP, 10877 Hazelview Ave., Alliance OH 44601.

### PITTSFIELD MA
#### JUL 21-22

The NoBARC Hamfest will be held on July 21-22, 1979, at Cummington Fairgrounds, Pittsfield, Massachusetts. There will be tech talks, demonstrations, and dealers. Flea market admission is $1.00. Advance registration is $3.00 single and $5.00 with spouse, and $4.00/$6.00 at the gate. Gates open at 5:00 pm on Friday for free camping. Talk-in on 146.31/.91. For reservations, contact Tom Hamilton WA1VPX, 206 California Ave., Pittsfield MA 01201.

### ESSEX MT
#### JUL 21-22

The International Glacier-Waterton Hamfest will be held on July 21-22, 1979, at the Three Forks Campground, ten miles east of Essex, Montana, on US Highway 2. Registration is at 9:00 am. Talk-in on .52 and

.34/.94. For more information, write Glacier-Waterton Hamfest, PO Box 2225, Missoula MT 59806.

### EUGENE OR
### JUL 21-22

The 4th annual Lane County Ham Fair will be held on July 21-22, 1979, at the Oregon National Guard Armory, 2515 Centennial Blvd., Eugene, Oregon. Registration is $3.00, and an extra drawing ticket is given with advance registration. There will be displays, lectures, contests, swapshop, transmitter hunt, and entertainment. The facilities provide plenty of free parking for motor homes and trailers.

For information and advance reservations, phone or write Wanda or Earl Hemenway, 2366 Madison, Eugene OR 97405 at (503)-485-5575.

### MARSHALL MO
### JUL 22

The Indian Foothills Amateur Radio Club will hold its 4th annual hamfest on July 22, 1979, at the Saline County Fairgrounds, Marshall, Missouri. Tickets are $2.00 each or 3 for $5.00 in advance; $2.50 at the door. Registration is at 8:00 am, with lunch at 11:30 pm (all you can eat) and the drawing at 2:30 pm. Prizes include a Tempo S1, a Dentron Jr. Monitor™ tuner, and many more. There will be flea markets for the OM and XYL. There is no charge for flea market tables this year, but reservations are requested. There will also be old and new equipment displays, a 10-X booth, and other activities for the XYLs. Talk-in on .52, .28/.88, and 147.84/.24. For information and tickets, write Norman Gibbins WB0SZI, 692 North Ted, Marshall MO 65340.

### MOOSE JAW SASKATCHEWAN CAN
### JUL 27-29

The Moose Jaw Amateur Radio Club will hold its 1979 Hamfest (Particifest 79) on July 27-29, 1979, at the Saskatchewan Technical Institute, 600 Saskatchewan St. W., Moose Jaw, Saskatchewan, Canada. Registration will be held on Friday evening with a full day of activities on Saturday culminating in a banquet and dance. Most of the meetings and workshops will be held on Sunday. There will also be a busy schedule for the XYLs.

### OLIVER BC CAN
### JUL 28-29

The Okanagan International Hamfest will be held on July 28-29, 1979, at Gallagher Lake KOA Kampsite, 8 miles north of Oliver, B.C., Canada. Registration starts at 9:00 am Saturday. Activities start at 1:00 pm Saturday and continue until 2:00 pm Sunday. Ladies may bring their hobbies and items for a white-elephant sale. Featured will be prizes, a flea market, bunny hunts, entertainment, a home-brew contest, and more. A potluck lunch will be served Sunday at noon. Call-in on 3800, .34/.94, and .76 simplex. For information, write John Juul-Andersen VE7DTX, 8802 Lakeview Dr., Vernon, B.C., Canada V1B 1W3, or Lota Harvey VE7DKL, 584 Heather Rd., Penticton, B.C., Canada V2A 1W8.

### BOWLING GREEN OH
### JUL 29

The Wood County Amateur Radio Club will hold its 15th annual Wood County Ham-a-Rama on July 29, 1979, at the Bowling Green Fairgrounds, Bowling Green, Ohio. Gates will open at 10:00 am, with free admission and parking. Dealer tables and space are available. Trunk sale space and food will also be available. Tickets are $1.50 in advance and $2.00 at the door. Prizes will be awarded. Talk-in on .52 K8TIH. For information, write Wood County ARC, c/o Eric Willman, 14118 Bishop Road, Bowling Green OH 43402.

### JACKSONVILLE FL
### AUG 4-5

The Jacksonville Hamfest Association is pleased to announce the 1979 Jacksonville Hamfest and ARRL North Florida Section Convention to be held on August 4-5, 1979, at the Jacksonville Beach Municipal Auditorium, Jacksonville, Florida. The location is just one block from the beach, where U.S. 90 meets the sea.

Advanced registrations are available at $3.00 per person from R. J. Cutting W2KGI/4, 303 10th St., Atlantic Beach, Florida

*Continued on page 165*

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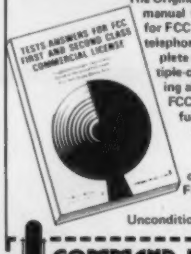
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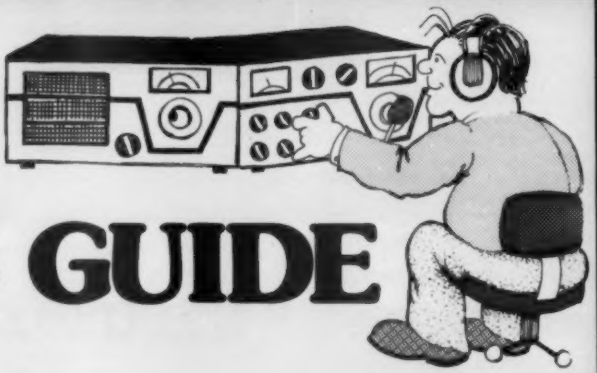

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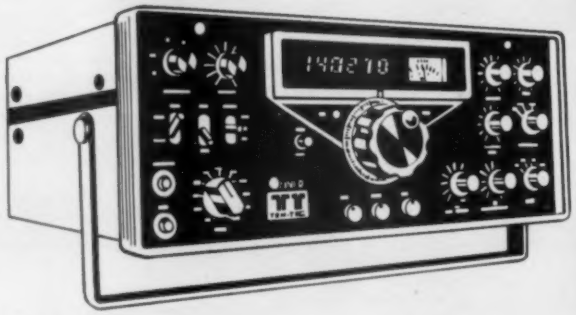

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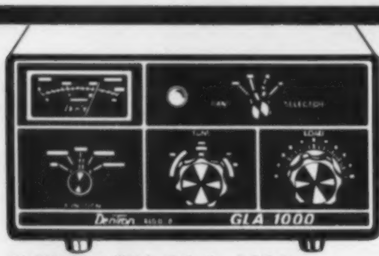

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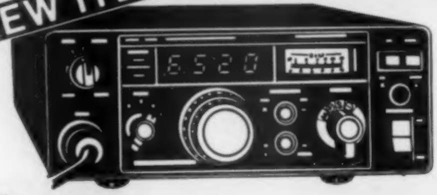

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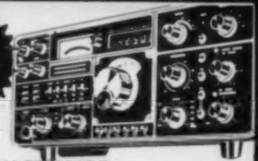

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A competition grade transceiver, it has freq coverage of 160 thru 10 meters, 200W PEP, RF speech processor, built-in VFO, reject tuning, variable IF band width tuning, LED freq display, built-in Curtis keyer, 6146B final tubes, audio peak freq tuning

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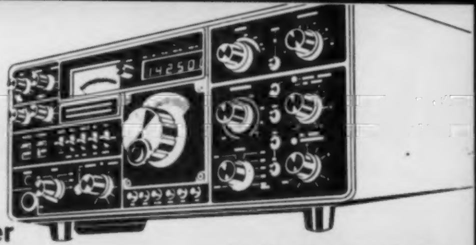

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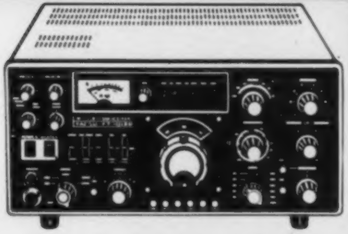

**YAESU FT-101ZD transceiver**

Freq. coverage: 160 thru 10 meters plus WWV, modes: LSB, USB, CW, input power: 180W DC, digital & analog freq. readout, 6146B finals, RF speech processor, variable IF bandwidth 300 HZ to 2.4 KHz, heater switch, VOX, and noise blanker, built-in power supply.

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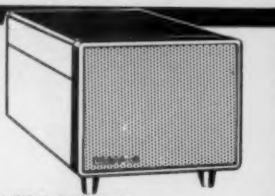

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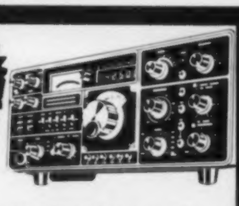

**YAESU FT-901D HF transceiver**

Coverage: 160 thru 10 meters, 200W PEP, RF speech processor, built-in VFO, reject tuning, variable IF band width tuning, LED freq. display 6146B final tubes, AC/DC power supply, FM unit, audio peak freq. tuning

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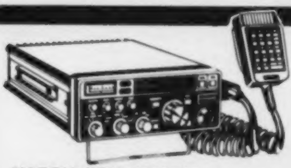

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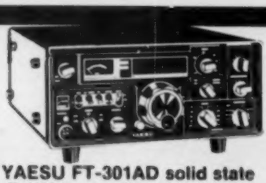

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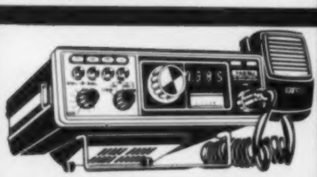

**YAESU FT-227R 2m FM transceiver**

With 1 memory channel, this also has freq. coverage: 144 to 148 MHz, 800 channels, power requirements: 13.8 VDC @ 2.5 amps continuous RF output: 1W hi/1W lo tone burst, ± 600 KHz repeater offset.

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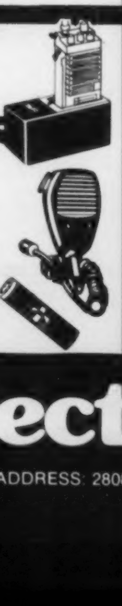

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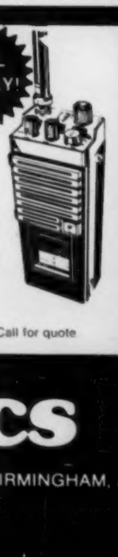

**YAESU FT-202R 2m handheld FM transceiver**

1 watt output minimum, 6 channel capability, flexible helical whip antenna, equipped with toneburst, compact size and light weight, S-meter and battery condition indicator, operates on 8 AA NiCad or 7 AA dry cell batteries 3pr. Xtals incl.

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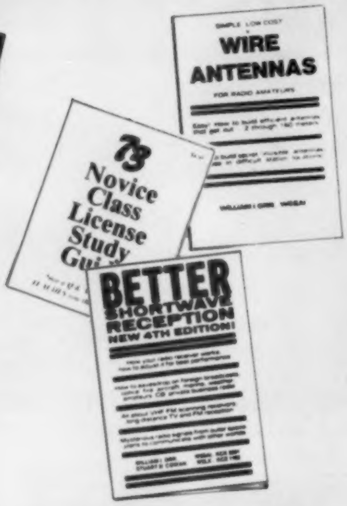

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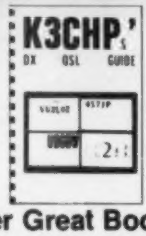

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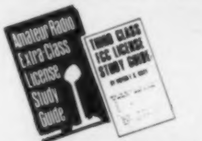

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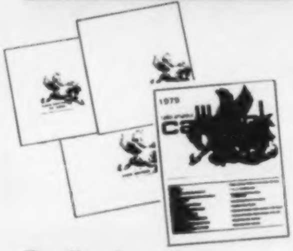

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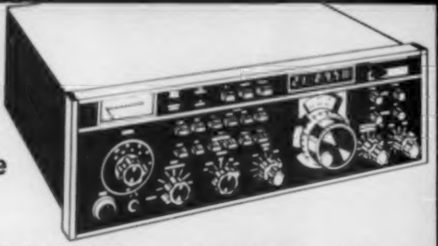

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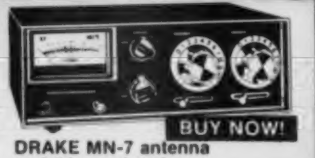

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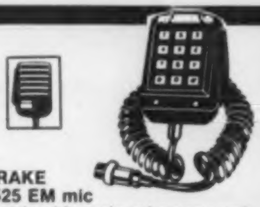

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The auto-patch encoder and mic are a single unit. It features high accuracy IC tone generator, & Digitran keyboard. Power for tone encoder from transceiver via mic cable. Encoder audio level adjustable from 1mV to 5mV with internal potentiometer. Low output impedance. 4-pin plug.

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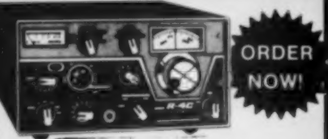

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## DRAKE R-4C receiver

Covers 80, 40, 20, 15 meters and 28.5 to 29.0 MHz of 10 meters plus any 500 KHz range between 1.5 and 30 MHz. Can also be used for MARS, WWV, CB, Marine, & Shortwave broadcasts. VFO modes: SSB, CW, AM, RTTY, SSTV, 3 AGC release times, crystal lattice filter in first IF prevents cross modulation, antenna impedance 52 ohms, audio output: 2 watts into 3.2 ohms.

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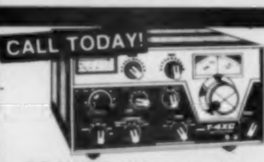

## DRAKE T-4XC transmitter

Covers 80, 40, 20, 15 meters and 28.5 to 29.0 MHz of 10 meters. Covers 160 meters with accessory crystal. Has 2 8-pole crystal lattice filters for SSB selection, modes: SSB, CW, AM. Controlled carrier modulation for AM, built-in VOX or PTT on SSB or AM, TX AGC prevents flat topping, built-in CW sidetone, RTTY easy adaption, AFSK or FSK, input power: 200W PEP. Requires AC-4 power supply.

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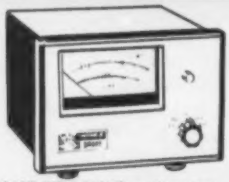

## DRAKE WH-7 HF wattmeter

Frequency: 1.8-54 MHz, power range: 0-20, 200, and 2000 watts full scale. Features a direct scale readout for VSWR. Sensing element can be located up to 3 ft. away from the unit, connectors SO-239, line impedance: 50 ohms resistance.

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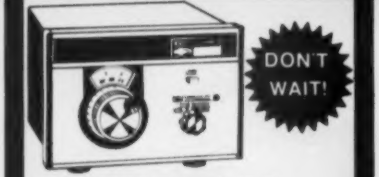

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## DRAKE RV-7 remote VFO

Designed for use with the TR/DR7, it offers high frequency control flexibility. It can be used for transmit, receive, or transceive frequency control. The RV-7 includes a special "spot" function for easy zero beating. 4' cable included.

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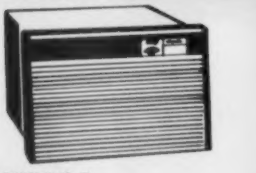

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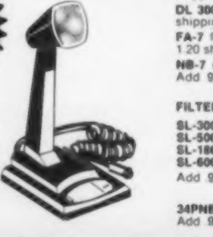

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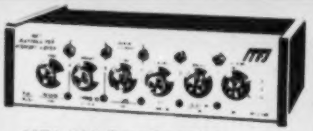

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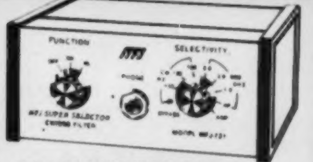

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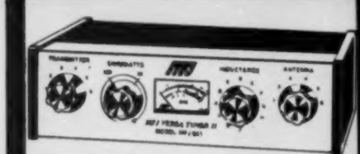

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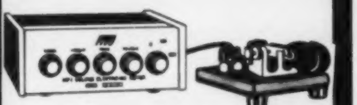

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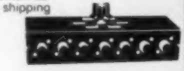

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**5 position coax switch**

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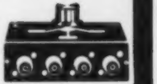

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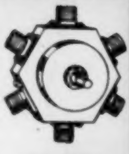

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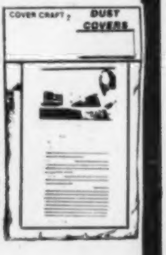

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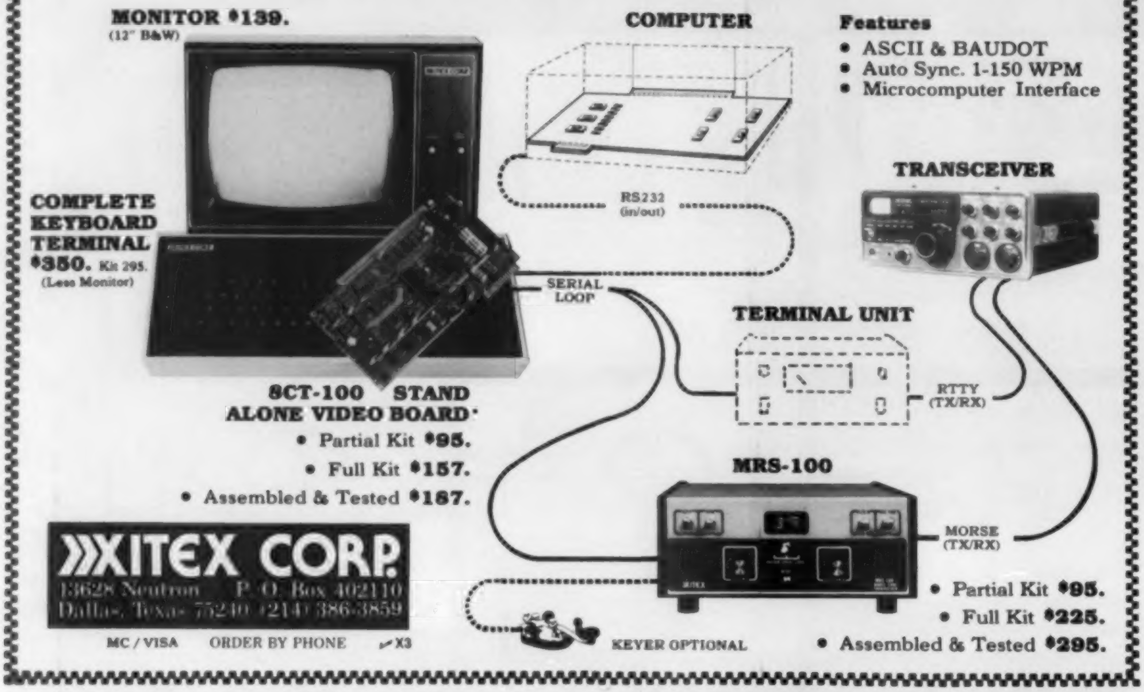

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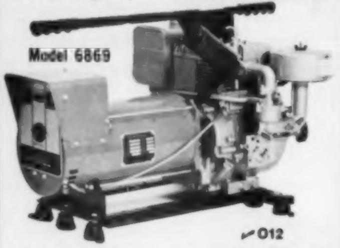

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DSI C1000 1 GHz Frequency Counter

DSI C-700 700 MHz Frequency Counter

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| Model | Frequency Range | Proportional Oven Accuracy Over Temperature | 50Hz To 75MHz | 75MHz To 500MHz | 500MHz To 1GHz | Number Of Digits | Size Of Digits | Power Requirements | Size |
|---|---|---|---|---|---|---|---|---|---|
| C700 | 50Hz to 700MHz | .2PPM 0° to 40°C | 50MV | 10MV | NA | 8 | .5 Inch | 115 VAC-BATT 8 to 15VDC | 3"H x 8"W x 6"D |
| C1000 | 10Hz to 1GHz | .1PPM 0° to 40°C | 20MV | 1MV | >50MV | 9 | .5 Inch | 115VAC-BATT 8 to 15VDC | 4"H x 10"W x 7½"D |

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- INCLUDES INTERNAL BATTERY HOLDER
- SAME AS 3600A LESS OVEN
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| Model | Frequency Range | Accuracy Over Temperature | @ 146MHz | @ 220MHz | @ 450MHz | Number of Readouts | Size of Readouts | Power Requirements | Size |
|---|---|---|---|---|---|---|---|---|---|
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| 3600A | 50Hz - 600MHz | Oven<br>.5 PPM 17° - 37°C | 10MV | 10MV | 50MV | 8 | .5 Inch | 115VAC or<br>8.2 - 14.5VDC | 2¼"H x 8"W x 5"D |
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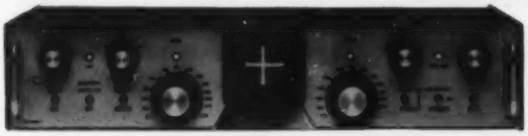

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*The MPC-1000R is also available without a TSR assembly and functions as a MPC-1000C with a Triple Tone-Pair AFSK Tone Keyer. This "Basic-R" permits future expansion with a TSR-100, TSR-200, TSR-200D or TSR-500 by simply lifting the lid and plugging in the appropriate TSR assembly: Amateur Net (Basic-R): $595.00

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CONTINUOUSLY TUNABLE Any frequency between 67 Hz and 250.3 Hz
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Shortly after the ad for the Sabtronics Model 2000 digital multimeter appeared in *73 Magazine*, I sent in my check for one. I suspect that quite a large number of other people did the same, since my order was delayed several weeks. When the DMM finally arrived, I assembled the kit and, to my surprise, it worked the first time I turned it on. After calibration, using the supplied resistors as references, the meter's performance compared quite favorably to that of a more expensive DMM.

I was pleased with the meter for its performance, and pleased with myself for taking advantage of a good deal, until I noticed the meter would not zero on the ac scales. With the input leads shorted, the display would eventually settle down at about 0.5 volts on the 10.0-volt scale. A quick check showed that all of the ac voltage and current scales were affected.

At first I assumed that I had made some mistake in construction, but checking with two other owners of the Model 2000, I found that they noticed the same problem.

Fortunately, the design error is easy to correct. I will describe the necessary modification, plus a relocation of the fuse holder and installation of nicad batteries and a charger for convenience.

After I studied the board layout and schematic for the DMM, I tried a few things that looked as if they might correct the trouble. I found that if I unhooked the +6 volts that powered the decimal points, the meter would zero properly. Apparently, the high level dc line that feeds the decimal points is located too near the low level ac lines on the main PC board. You can see there is quite a mess of traces carrying the various signals to the range and function switches if you check the layout diagrams in the manual.

Before I describe the modifications I made to the circuitry, I want to say that I have had no contact with Sabtronics on this matter. I hope they corrected the problem in later model runs, but I do not know. Obviously, you can check to see if your meter has the problem by simply

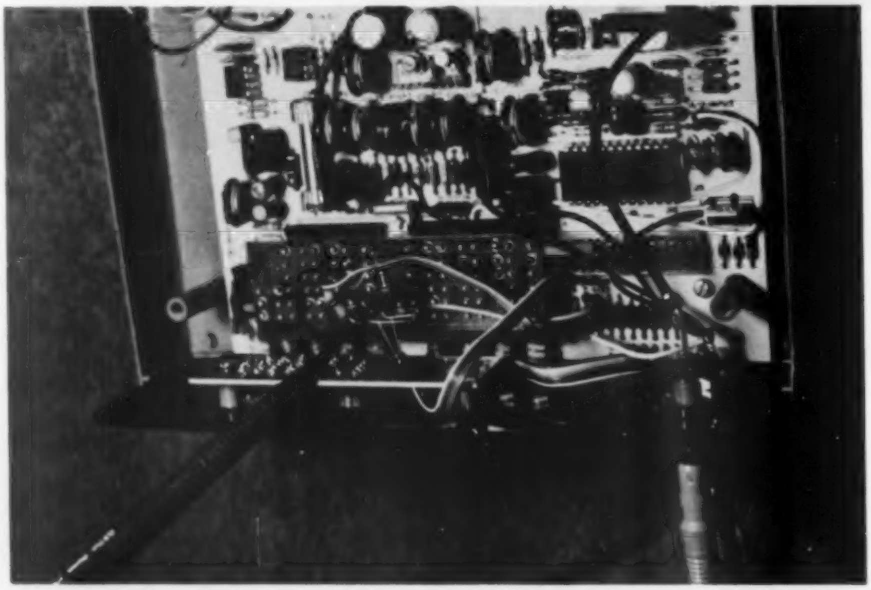

*Photo 1. This is the display board of the Model 2000 DMM, showing the added transistors that drive the decimal points.*

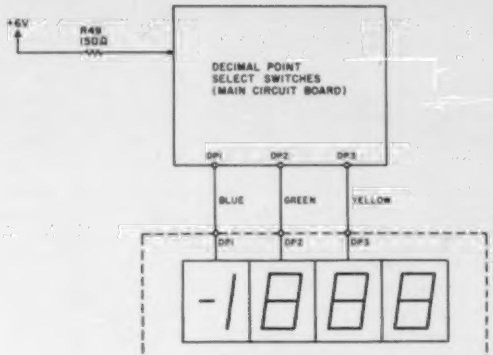
+6V
R49
150Ω
DECIMAL POINT
SELECT SWITCHES
(MAIN CIRCUIT BOARD)
DP1
DP2
DP3
BLUE
GREEN
YELLOW
DP1
DP2
DP3
-1888
DISPLAY CIRCUIT BOARD

*Fig. 1(a). Block diagram of decimal point driver circuitry of the Model 2000 DMM before modification.*

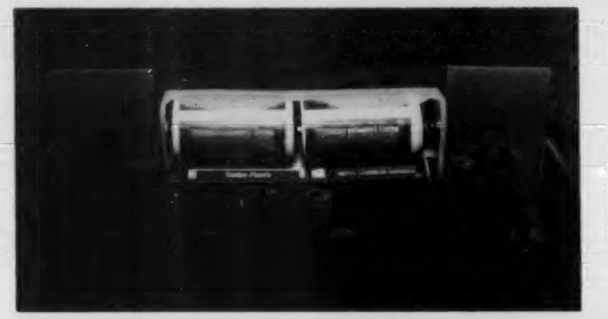

*Photo 2. This pictures the rear of the DMM, showing the added fuse holder on the right and the charging jack and components on the left.*

shorting the input leads and punching up the 10.0-volt ac range.

If you refer to Fig. 1(a) and compare the simplified diagram with the schematic in your manual, you will see that the range and function switches drive the decimal points directly off the +6.0-volt line through R49 (150 Ohms). Fig. 1(b) shows a block diagram of the circuit after modification. The modification requires only three garden-variety PNP transistors and three ½- or ¼-Watt resistors. You do not have to cut or modify any of the traces on the PC boards.

Fig. 2 shows the actual schematic of the added circuitry. The transistors drive the decimal points; the switching arrangement on the DMM main PC board is now near ground potential and carries only the small base current needed to drive the transistors. Although a small PC board would have allowed a neat installation, I did not think it was necessary for so few parts. In the following steps, refer to the diagrams of the PC boards in your Sabtronics manual as well as to the diagrams and photographs I have supplied.

Photo 1 shows how the transistors are mounted on the display board. First, unsolder the end of R49 that is nearest the edge of the main PC board. Bend this resistor straight up so that it is perpendicular to the board. Solder a short length of hookup wire from the hole where you just removed R49 to the ground lug on the input terminals of the front panel. Now remove the three wires on the display board marked DP1, DP2, and DP3. You can do this without removing the board if you are careful. Prepare the three driver transistors by bending the base lead of each one back over the case so that it is parallel to the other leads but pointing in the opposite direction. Solder one of the resistors to each base lead. I used 10k-Ohm resistors with the junk box transistors I had, but you may need to use smaller values (on the order of 2k) with some transistors.

Working on the back (side of the board with traces) of the display board, solder the collector lead of one of the prepared transistors in the hole marked DP1 where you re-

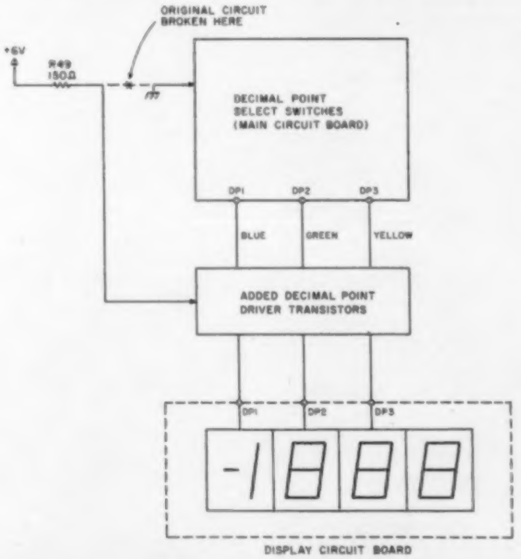
ORIGINAL CIRCUIT
BROKEN HERE
+6V
R49
150Ω
DECIMAL POINT
SELECT SWITCHES
(MAIN CIRCUIT BOARD)
DP1
DP2
DP3
BLUE
GREEN
YELLOW
ADDED DECIMAL POINT
DRIVER TRANSISTORS
DP1
DP2
DP3
-1888
DISPLAY CIRCUIT BOARD

*Fig. 1(b). Block diagram of the decimal point driver circuitry of the Model 2000 DMM after modification.*

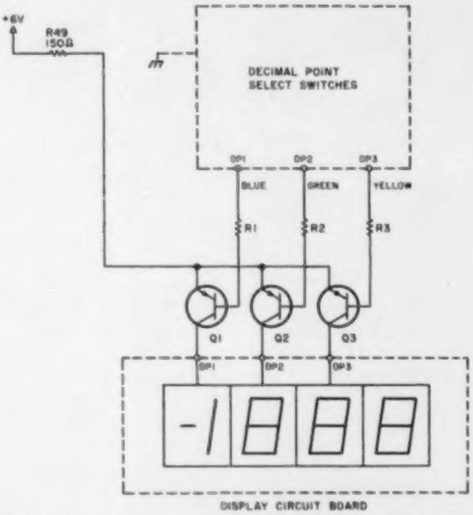
+6V
R49
150Ω
DECIMAL POINT
SELECT SWITCHES
DP1
DP2
DP3
BLUE
GREEN
YELLOW
R1
R2
R3
Q1
Q2
Q3
DP1
DP2
DP3
-1888
DISPLAY CIRCUIT BOARD

*Fig. 2. Schematic of decimal point driver circuitry. R49 is part of the original DMM circuit. The transistors are added to the back of the display PC board. R1, R2, R3: 2.2-10kΩ (see text), ¼ to ½ Watt. Q1, Q2, Q3: any silicon PNP general purpose transistor, such as Radio Shack 276-1604.*

moved the wire previously. Install the other two transistors in the holes marked DP2 and DP3. Solder the emitter leads of all three transistors together and attach a wire from the emitter leads to the free end of R49 on the main PC board. Finally, solder the free ends of the wires you removed from the display board to the corresponding resistor on the driver transistors you installed. This completes the decimal point modification and the meter should zero properly on all the ac scales after a few seconds. After you are sure everything is working properly, you may want to insulate the transistors with some silicone rubber or tape.

The second modification to the Model 2000 was simply the moving of the fuse holder. I manage to blow the fuse in my DMM about once a month by punching the current button with the leads connected to a battery. Since the fuse is mounted inside the Sabtronics meter, changing it requires that the case be disassembled. Unfortunately, I could not train myself not to blow the fuse, so I did the next best thing—I mounted a panel-type fuse holder on the right rear of the meter (Photo 2). I chose a Radio Shack (270-365) fuse holder since it extends only 0.5 cm on the back of the panel. If you install a fuse holder, short out the old one on the PC board. A short piece of a potentiometer shaft works very nicely for this. You must use shielded cable running to the fuse holder since the power supply of the meter generates considerable noise and the longer input lead will pick this up.

The last thing I did to the DMM was install rechargeable batteries. If you use your meter very much, you will find that replacing batteries is not only a nuisance but also expensive. I used some surplus nicad C cells that I ordered for $1.50 each. In order to charge the batteries without opening the case, I installed a miniature phone jack in the other panel on the rear of the meter (see Photo 2). For charging, I used one of the little transformers with which the phone company powers the dial lamps in some phones. The simple charging circuit is shown in Fig. 3. If you have one of these transformers (who doesn't?), a 12-Ohm, ½-Watt resistor for R4 will give the proper charge current for 1-Ah cells. If you don't have a transformer, a Radio Shack 12.6-volt transformer (273-1385) will give the proper 100-mA current with a 33-Ohm, ½-Watt resistor. Do not try to measure the charge current with the batteries installed in the meter unless you use another meter.

If you make these modifications to your DMM, you will have improved performance on the ac scales and the unit will be easier to maintain. I will be glad to answer any questions accompanied by an SASE. ■

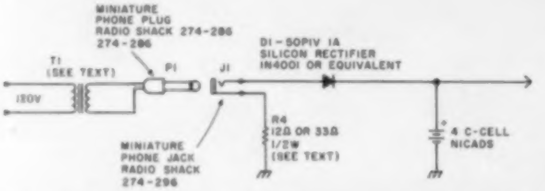
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Fig. 3. Charging circuit for nicad batteries installed in the Model 2000 DMM. Adjust R4 for 100-mA charging current.

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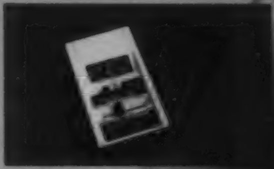

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s there a motorcyclist who has not felt dumb and hazardous after discovering that he has had his turn signals on for five minutes after making a turn? Here's a simple circuit to time them out in thirty seconds, if you forget. A few new bikes have a similar device; some riders install an audible indicator—but this is not dignified, honking away.

The 555 is used as a standard monostable timer from the *Motorola Linear I.C. Data Book*. Refer to the schematic. When the turn signal switch is turned on, pins 2 and 4 go high, which starts the timer and begins to charge C2. Pin 3 is high, keeping the relay off. When C2 is charged to 2/3 Vcc—thirty seconds in this case—pin 3 goes low and sinks the relay coil which opens the turn signal circuit. When the turn signal switch is turned off, pins 2 and 4 go low, which resets the 555; at this time Q1 turns off and prevents C2 from being charged, so you will have a full 30 seconds of flashing time at the next intersection.

*Photo of the turn signal timeout.*

C3 is needed to prevent false resetting while flashing. My theory is that C1's delay keeps pins 2 and 4 high enough to prevent resetting during the time when the flasher opens the circuit. Somehow, C1 has to be electrolytic; a tantalum-type does not do the job. Too large a C1 causes a long reset delay.

Due to variations in forward voltage drop among silicon and germanium diodes, and due to variations in flasher rates, I suggest that the Q1 base resistor be a 250k trimpot. I found that it should be set at 80k us-

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ing 1N914s, and 180k using 1N34s, in order to keep Q1 on, and thus charge C2. The exact resistance required is quite critical, but provides reliable operation, once determined.

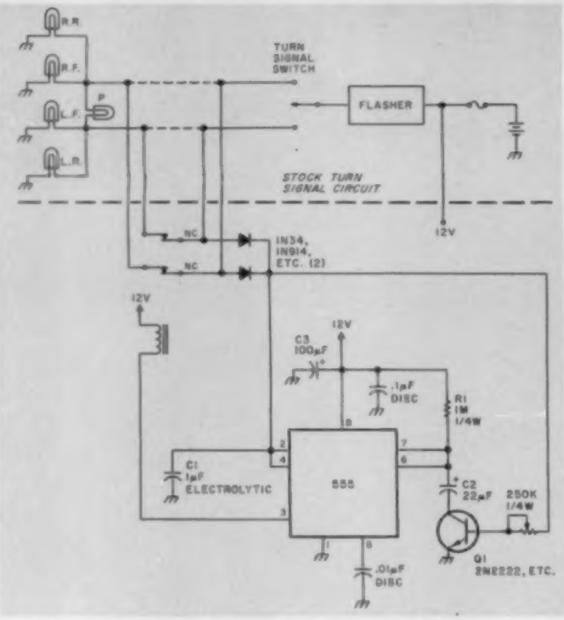
Time-out is determined by the formula: T(sec.) = 1.1 x R1 x C2. R1 is in megohms, C2 is in farads, and tolerances of components require experimentation, which explains my six-second discrepancy from the formula.

Any DPDT relay with 5-Amp, or so, contacts, and 12-volt coil should do, keeping in mind the 200-mA sinking capability of a 555. I used a Potter & Brumfield R10-E1-X2-V185.

I epoxied the relay to vectorboard, on which all components were mounted; this was stuck into a 1-5/8" x 2-1/8" x 2-3/4" minibox from the junk box. The six leads were brought out to a barrier terminal strip on the box. The box was installed under the left side cover of a Kawasaki 900 where, conveniently, there were two unused welded nuts on the battery box. After installation, my hindsight saw that there was space for the entire kludge under the tank. The circuit could be made much smaller for other machines, if called for.

Wiring to this bike required cutting the left and right turn signal wires after the switch; these were found in a harness under the fuel tank. These four points are then connected to the NC relay contacts, keeping in mind which is "in" and "out" for sensing purposes.

For fully solid state, I don't see why 2N3055-type transistors could not be used instead of a relay, if you want to tolerate their voltage drop. Knowing 555s, possibly the timer should be set longer for cold weather riders.



*Schematic for the turn signal timeout.*

It works! It's imperfect, and requires resetting in traffic jams. It even seems to make itself unnecessary by making one more conscious of its purpose!

Credit is due to K1ICU for his idea, and for the use of his Kaw as a guinea pig.■

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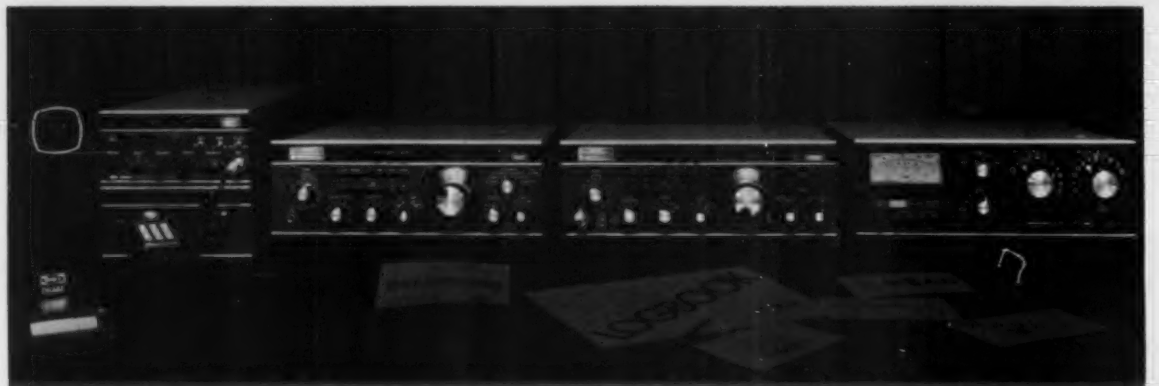

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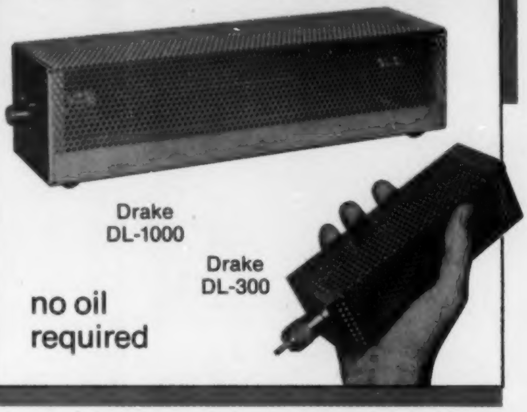

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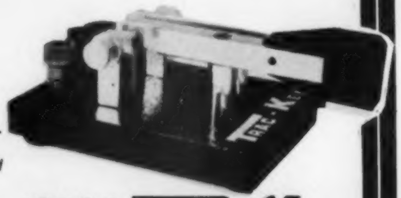

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# Looking West

from page 6

along these lines is a far better alternative than brute-force vigilantism, which lowers those involved to the level of the offender himself.

Finally, to those who still feel Scott Lookholder got off easy, let's look at the overall picture. Lawyers I have spoken with tell me that a viable estimate of his legal costs would be between 4 and 6 thousand dollars. Add to this another thousand to satisfy the fine, and financially it may have cost him close to $7,000. Only he and his attorney know for sure. Then, too, he has lost the use of something many of us hold dear: the ability to communicate via his amateur station. Remember, the court made it a provision of his probation that he not utilize his amateur privileges for at least a year. There is also the possibility that the FCC will begin proceedings to revoke his license, thereby making his QRT period permanent. Nobody knows if this will happen, but it is a distinct possibility. No, Scott Lookholder did not get off easy by a long shot. It cost him dearly, and hopefully it will be a lesson to others who have thoughts of engaging in similar illegal activities.

While we are on the subject of malicious interference, I would like to discuss another new type with you for a moment. One might almost call it "legal interference," but it is morally wrong nevertheless. It usually shows up when a group of two or three who want to see just how much they can get away with take over and monopolize a given repeater. They carefully structure their remarks so as to not violate any rules and regulations as set forth by the Commission, but nonetheless their statements are constructed in such a way as to "get the goat" of all others who may be listening. Usually, they will not recognize breakers, and those who do make it in find themselves harassed in one way or another. These bothersome people play it strictly by the rulebook, including proper station identification at the prescribed intervals. They always "stand on their constitutional right of freedom of speech" and in doing so take away yours and mine. If this sounds all too familiar, then you have such a faction in your home town.

What can be done about them? First, all of us have to remember that our amateur licenses are not a guarantee of freedom of speech. Rather, it is a privilege to communicate granted by our government, and it can be revoked any time the government sees fit. There are no rights stated or implied. Herein lies at least part of the solution. Since a repeater is not a public utility, the licensee is under no obligation to provide this service to those he deems are abusing it. The repeater owner-operator has one very effective weapon at hand: the ability to take away the toy from those who do not appreciate it. Many owners hesitate to take such action, fearing that a time will come when some user will want to make an emergency call and the system will be off. True, this can happen, but if the same amateur wants to make this call and the repeater is being abused by those who do not respect it, he will have no better chance then anyway. It is up to the technical minds who produced the myriad of FM relay devices which now stretch the length and breadth of this nation to fulfill their obligation to the amateur community by initiating a cleanup of the bad on-the-air operation. If they do not, and if abuses continue to grow, they will only have themselves to blame when the ax falls—when the FCC and other government agencies start to do it for them. Repeater owner-operators have more than just a technical responsibility to erect and maintain a system. There is also a moral obligation to ensure the proper utilization of a given system. If they fail in this, they should not be permitted the privilege of continued system ownership. The day in which a repeater owner-operator can isolate himself from the rest of the amateur community is long gone. His responsibilities are clear-cut and he must discharge them for the good of the community.

### THE SOME-PEOPLE-NEVER-LEARN DEPARTMENT

Maybe it would be better to call this "Once Involved, Always Involved." This might be the motto of Bob Thornburg WB6JPI. After two years of political hiatus, Bob was elected earlier this month to the chairmanship of TASMA, the organization which replaced the old SCRA in the middle of 1978. Bob sees his job as one of uniting the various special interests which abound on two meters. Frankly, it looks as if he has his work cut out for him. While Association membership by those involved in other aspects of two meter operation has been steadily on the rise, repeater owners seem to be staying away as if to protect the organizational structure change.

Late last year, just around the time of the change, a rather vile letter was circulated to many or all area repeater owners calling for the destruction of the SCRA and its new open-door policy and "a return of political power to those competent to administer it." The letter went on to give steps which should be taken by repeater owner-operators to ensure that the above would indeed happen. However—and this is very important—the letter was basically unsigned, a condition which thus destroyed its overall credibility. Whether this letter has had anything to do with the lack of organizational interest on the part of repeater owner-operators cannot be determined. One thing is clear: They are staying away, and Bob will have quite a job during the next twelve months trying to bring them back into the fold. It won't be the first time that Bob has pulled off a miracle. He is very adept in that regard. Can he do it? If he can't, nobody can.

Already, Bob has support from virtually every other segment of southern California's two meter society, including the weak-signal people and repeater-user groups. Indeed, he is a very popular and well-respected individual in this area who honestly cares about his fellow man. He has taken on a very big responsibility, and we wish him well.

It's hard to find a reason for this lack of initiative on the part of this area's two meter repeater owners. No one reason seems to predominate. Some speculate that many of the oldliners who helped start voluntary coordination are just tired of the political arena and want out. As with any organization, attrition along these lines is to be expected. No one group of in-

*In attendance at the TASMA meeting were Jim Rieger WA6EZL and ED Tippler WA6KYZ. Jim is probably the nation's best authority on linear translators.*

*Marlene Thornburg WD6FBI sips soda as Herb Gordon W6KBD explains her new duties as TASMA treasurer.*

dividuals can be expected to stand in front of the firing line forever. In other cases, it's obviously apathy. They have their systems operational and nothing else concerns them. Why should they get involved? They need involvement like they need a headache. More predominant, however, is an unspoken sentiment which seems to say that the organization no longer represents those whom it was established to protect—the southern California repeater owner-operator—and that opening voting membership to all interested amateurs has weakened the political position of the repeater owner. Therefore, why should an owner-operator bother to keep membership in an organization in which he is no longer in the majority position. This was the view stated in the letter discussed earlier.

It's interesting to note that the 220-SMA, which was formed at the same meeting, suffers none of these ills. The 220 people of this area, system owner and spectrum user alike, seem very together in their goals and viewpoints. Structurally, the two organizations are almost identical, yet 220 keeps its repeater owners as members while two meters can't. Why the unity on 220 not found on two meters? Is it because all 220 spectrum users see the US WARC proposal as a common enemy? Is it that they have watched the development of two meters and have sworn that the same pitfalls will never occur on 220? No one can rightly say. However, at this time, the 220 people of this area are far more together than any other group. Perhaps it's time for everyone to step back and take a good look at what has put them in such a position. The 220-SMA is going strong, and we can all learn from them.

All the above might lead you to believe that two meters in this area is in a disastrous state. Far from it. TASMA's 2 meter band plan has been accepted without complaint, and while repeater owner support is dwindling, support from all other sectors of the two meter society is strong and growing. However, making overall spectrum management work takes the ongoing cooperation of all users. Those who own and operate repeaters are a key part of two meters, and it's to soliciting their active support that Bob and his staff will be dedicated.

### DX-ON-A-REPEATER DEPARTMENT

Southern California is known as an area of "repeaters with a purpose." Over the past few years, we have seen systems developed for just about every reason under the sun, including one for the exclusive use of school children. Now, thanks to the Southern California DX Club, even HF DXers have a meeting ground of their own. According to club president Dave Bell W6AQ, while not the first system of its type in the nation, the AD6P/R system will serve as more than just a local gab channel for DXers. The club has great plans for the newly established system, and the future seems bright with promise. Already, it is used to alert members as to where the rare ones can be found. In the future, one might even hear actual on-the-air seminars on the art of DX-chasing.

While its prime usership is made up of DXers, AD6P (144.88 in/145.48 out) is an open repeater which invites all area amateurs as well as visitors to Los Angeles to utilize its facilities. If you happen through LA and want to meet some of its top DX enthusiasts, then drop in on the system or, if time permits, attend one of their club meetings. You will find either one a rewarding experience.

### ON-THE-MOVE DEPARTMENT

Jim Hendershot WA6VQP, network director for Westlink, asks that I pass along the news that the new Westlink studio facilities are fully operational at their new location in Canoga Park, California. The new studio features such amenities as cartridge tape units used to gather and pre-edit items for the newscast and additional post-production duplicating equipment to cut down the reproduction time of finished cassettes. He still hopes to expand the reproduction facilities further when funds permit the acquisition of more cassette recorders.

What started a year and a half ago as a small undertaking to produce a weekly amateur radio news program has grown to an enterprise which serves the news needs of thousands of amateurs nationwide. Now in its seventy-second week of consecutive operation, the Westlink Amateur Radio News Service has become a vital link in keeping us all informed of events which affect our day-to-day operation. It is still free to any group or individual who supplies blank cassette tapes in SASE mailers. For more information about this service, contact Jim at Westlink's new address: 8331 Joan Lane, Canoga Park CA 91304.

### HF INTERNATIONAL: AN OUTSIDER LOOKS IN

It was not until after I arranged the interview with Norm and Jeanne Meuller that I first bothered to listen to the spectrum HFI calls its home, CB channels 32 through 40. I expected to hear the same type of "10-4 Good Buddy" operation as is found on what CBers call the "lower 23," but was quite taken aback by what I actually heard. Frankly, it sounded a lot closer to 20 or 40 than to what I expected. Operation seemed very structured and in no way haphazard. Other than the strange-sounding dual callsign bit (HFI members utilize both their assigned FCC callsign and their HFI call or "HF number"), the operation seemed as if it could be taking place on any of the amateur bands. I was shocked, perplexed, and maybe a bit mad. After all, here I proudly sat with an amateur license displayed on the wall. Who were these people to play ham without bothering to be hams!

The following Sunday I met with Norm and Jeanne. Upon entering Norm's office, I noted two things immediately: an absolutely marvelous amateur station in one corner, and a large poster of Jerry Lewis touting HFI in relation to the annual MDA campaign. Inquiring, I learned two things right off the bat. It was indeed an amateur station, and Norm was licensed to use it. "My god," I thought to myself. "An amateur runs HFI?" The MDA poster was also explained. HFI and its close to 50,000 active members would be participating in the 1978 Labor Day Jerry Lewis telethon. I thought again to myself: "These are the bad guys who are out to destroy ham radio? The bad guys everyone had told me about? Something doesn't jive. Bad guys don't do nice things like this!"

The questions I asked ranged from simply what was HFI and its goals to what their official stand was on specific matters. Basically, here is what I learned: HFI is an organization of hobby-type SSB users operating in the upper portion of the 27 MHz personal radio band. It was founded to promote the use of SSB communication in that particular spectrum and to give the SSB CB hobbyist an organizational structure of his own. At its peak, HFI boasted more than 90,000 members, but this was prior to the reorganization. Though it is still quite large—probably still better than 50,000 at the latest estimate—no exact figure was available at the time of the interview.

Norm asked that I make it clear that HFI does not condone the use of excessive and illegal power levels or out-of-band operation. In his remarks, he made it clear that an HF number does not always mean that the holder is a current HFI member. Therefore, those operating illegally between the 11 and 10 meter bands are not necessarily **HFI members, though some may still use their HFI numbers issued many years ago. All of the foregoing has been reiterated to the members of HFI in recent membership mailings, in which Norm stressed the need for legality in day-to-day on-the-air operation. Another point I was asked to emphasize was that HFI, under the current direction of Norm and Jeanne Mueller, never backed or condoned in any way the actions of Mr. Richard B. Cooper or his Communications Attorney Service. Norm's basic commentary was that Cooper/CAS was detrimental to both the amateur and CB services and would eventually cause both harm. Contrary to popular belief in amateur circles, HFI was not one of Cooper's ardent supporters.**

**Norm sees today's HFI as an intermediate ground between AM CB radio and the amateur service. He would like to see HFI take an active role in helping the CBer make the change, with as minimal an environmental impact on the amateur service as possible. He believes that the education of the transitioning CBer is the key. However, such education can only come about if the FCC acts to create "SSB only" channels wherein the AM CBer can get away from the "10-4 Good Buddy" attitudes of AM and learn proper operation from his SSB-minded peers. HFI feels that if such were the case, actual on-the-air amateur-oriented training could be accomplished (especially if CW were permitted).**

**As an amateur himself, Norm sees one of amateur radio's greatest problems today to be the uninitiated AM CBer who has the technical expertise to obtain an amateur license but has never been educated in the moral and operational values which amateurs associate with their hobby. He specifically cites many of the problems prevalent on FM repeaters as an example of this lack of proper indoctrination. Again, in relation to the amateur service, he sees this as an avenue for active HFI involvement.**

**While HFI would like more SSB-only spectrum for its members, Norm does not feel that it should come from the amateur bands. Rather, HFI endorses proposals which would place such spectrum directly next to the current 40-channel Class D allocation and above it in an area below 10 meters (with a buffer zone between the two). HFI feels, however, that such can only come to pass if all HF members obey the current regulations as written—especially those regarding proper station identification at prescribed intervals and respect for band-edge and power limitations. The**

organization knows that only a mass show of good faith to the FCC will have any meaning. To that end, HFI's literature constantly reminds its members of these precepts.

Above all, HFI wants to become a respected member of the hobby radio community. They want amateurs especially to know that they are not the enemy. They want to be considered as friends and working partners. It has taken me a year to sit down to write this, a year of waiting to see if I was being handed something substantial or just hot air. I have followed HFI's progress these past 12 months, and what I was told a year ago is substantially true today. Norm and Jeanne Mueller are two people who are sincerely devoted to their beliefs and who are very positive-thinking people. Under their leadership, HFI has taken many giant leaps toward its prime goal.

Whether you like or dislike organizations such as HFI is unimportant. What does count is that today's non-amateur hobby radio enthusiasts are responsible for a good percent of all personal radio operation and cannot be ignored. There are many myths these days in amateur circles about how anyone who owns a CB radio is a bad guy. Myths they are, and as such they should be dispelled. There are good guys and bad guys in every walk of life. We have both in amateur radio, and I'm sure that Norm has both in HFI. What is important is learning that we are all human beings with a common interest, even though we may express this interest in different ways. HFI has said to us, "We want to be your friend and work with you." What will our answer be? You can let me know, or you can write directly to Norm c/o HF International, PO Box 7576, Riverside CA 92513.

### THE WHATEVER-HAPPENED-TO-??? DEPARTMENT, REVISITED

Without warning recently, the FM and Repeater column seems to have disappeared from *QST!* It's well known that its editor, Lou McCoy W1ICP, has retired from active League duties and now lives in one of my favorite places, New Mexico. I sincerely wish Lou many prosperous years of retirement, as well as many more happy years of hamming.

However, Lou's departure seems to have left a rather big gap in Newington, one that should be filled quickly. In this day and age, when FM is on the lips of virtually every amateur, *QST* cannot afford to be without such a service to the ARRL membership. The column is necessary, and I, speaking as one ARRL member, would like to see it reinstated. Perhaps one of you reading this is willing to offer your services to the ARRL. Lou did a fine job with it, and his act will be hard to follow.

---

## Microcomputer Interfacing

*from page 28*

This means that one subroutine may call another. In this way, a control subroutine may, in turn, call a timer subroutine. When the timer subroutine has completed its task, it causes a return to the control subroutine. This situation requires two levels on the stack, or four R/W memory locations, since two full 16-bit return addresses must be maintained on the stack while the timer subroutine is in operation: (1) the return address for the timer-to-control link, and (2) the return address for the control-to-main-task link. *The stack operations take place automatically whenever a call or a return is executed.* The call and return instructions may be either conditional or unconditional, but each subroutine must contain at least one return instruction.

Recall that the 8080 chip contains seven 8-bit general purpose registers, the accumulator (A), B, C, D, E, H, and L. In programs where subroutines are used, there may be register conflicts since the subroutine and the main task may both require the use of a specific register. Sometimes this problem may be solved by choosing another register, but this is not always possible, particularly when the A register and the flags are involved. To avoid register conflicts, it is possible to use the stack for temporary data storage. All of the internal 8080 registers may be pushed onto the stack and popped back into the 8080 as needed. Data is stored and retrieved as register pairs, with register A and the flags forming a two-byte word which is treated as a register pair.

The subroutine in Table 1 is a time delay routine in which registers D, E, A, and the flags are stored on the stack. At the completion of the subroutine, the data stored on the stack is retrieved and placed back in the internal registers. The complementary operations of stack storage and retrieval are called *push* and *pop*, respectively. Notice that the stack pointer is initialized at the start of the program, before any other instructions are executed.

The use of subroutines in a program allows many complex tasks to be subdivided into small segments which are easy to link together and which relieve the problem of continuously rewriting frequently used program steps and routines. You will find that a personal library of frequently used subroutines is indispensible when you are programming.

---

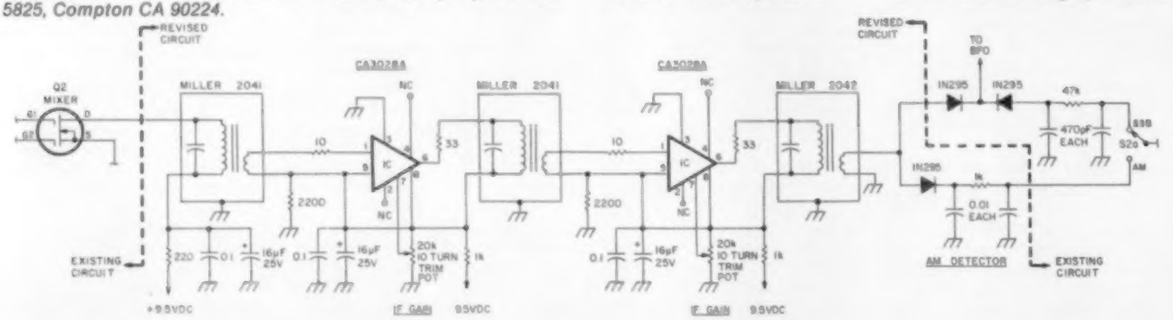
## Corrections

I have recently been advised that J. W. Miller Company no longer has the 8901-B and 8902-B i-f units which I used in my circuit on pp. 48-49 of the January, 1979, issue of *73* ("Building an Economy Receiver").

I have enclosed a copy of a revised i-f circuit which does use currently-available components.

**Tom McLaughlin WB4NEX**
**St. Petersburg FL**

*Fig. 1. Revised i-f circuitry, "Building an Economy Receiver." Resistors are ½-W, 10%. Miller 455-kHz transformer: #2041—input 25k, 600-Ω impedance; #2042—output 25k, 1-kΩ impedance. Transformers are available from J. W. Miller Company, PO Box 5825, Compton CA 90224.*



There are two errors in my article, "A Single IC Time Machine," which appears on page 148 of the February issue.

Both errors are in Fig. 15. In Fig. 15(a), the error is caused by a possible "smear." At the top of the figure, near the middle, there is a pad for the −5-V regulator. This pad is shown connected to the adjacent circuitry by a fine line. This fine line is possibly a "smear" from the original silk screen and should be removed.

The second error will raise a lot of eyebrows. Basically, it is an inversion. The grey area of the PCB of Fig. 15(a) should be rotated 180° on the darker overlay.

**H. M. Knickerbocker K6SK**
**La Mesa CA**

In response to a letter from one of our readers, Lee Reed W5VRC (ex-W4RBL), author of "Build An Economy Zener Checker" (February, 1979, page 137), would like to comment on his zener checking circuit.

The problem is the inherent danger of a transformerless line-operated power supply.

Should the "hot" side of the ac line be inadvertently connected to the "common" side of the unit, as it would if the ac plug were inserted backwards into a receptacle or if the ac socket is miswired, it is possible to get line voltage between the common side (which the user may be holding) and an external ground.

As a remedy for this, the use of a small isolation transformer is recommended or, at the very least, a 1k 2-Watt resistor should be added in series with the fuse.

A few dollars spent on a transformer is certainly worth the safety which it affords.

**Gene Smarte WB6TOV/1**
**News Editor**

In my article in the September, 1978, issue ("Nuclear Attack!"), I left out a very important "=" at step 193. Here is a procedure to fix the program:

1) Load the bad program into memory;
2) Press:
GTO 193
LRN
2nd Ins
=
LRN

This will insert the "=" between the "B" and the "X". I apologize to all.

I have been receiving requests for a version of the game to run on the TI 58/59. I will be glad to send anyone a program listing for this machine, provided the request is accompanied by an SASE.

**Dan Everhart WA7WKA**
**293 Lander Hall**
**University of Washington**
**Seattle WA 98105**

In "Impedance and Other Ogres" (February, 1979, page 47, column 1), the fourth and fifth lines from the bottom read, in part: "... $P_{AV} = E_{RMS} \times \text{Cos}\ \theta$." Since we do indeed believe in Ohm's Law, the formula should read: $P_{AV} = E_{RMS} \times I_{RMS} \times \text{Cos}\ \theta$. To our readers and Georg Simon Ohm, we apologize.

**Gene Smarte WB6TOV**
**News Editor**

# Review

When the *1979 Radio Amateur's Handbook* made its appearance last November, I was probably the first on the block to pay $9.75 and take a paperback copy home. The ARRL has put a lot of effort into promoting the *1979 Handbook* as being new and different. My 1974 edition is worn from heavy use and I moved it aside, making room for the newcomer, with a bit of reluctance.

The most obvious change in the new *Handbook* is the size. Like *QST*, the *License Manual*, and other League publications, the *Handbook* has gone to the bigger 8½" x 11" format. The new size makes older *Handbooks* look small and unimportant, but a quick weighing revealed that it was a scant 3½ ounces heavier than the 2-pound 1974 edition.

Old-timers will be glad to know that Ohm's Law is still V = IR in the elementary theory section. The basic principles haven't changed, but the theory chapters have been either completely or partially rewritten. Both beginning and experienced hams will find the "Radio Design Technique and Language" chapter useful. In addition to a comprehensive discussion on tuned circuits, a glossary of radio terms is included.

A chapter on vacuum-tube principles will not be found in the *1979 Handbook*; in its place there is a greatly expanded chapter on solid-state fundamentals. The *Handbook* editors have limited the coverage of this vast topic to those devices and applications that are most applicable to general amateur use.

The chapter on HF transmitting contains a number of charts and graphs that eliminate some of the drudgery of design calculations. The *Handbook*'s new size seems to lend itself well to this kind of presentation. Throughout the edition, graphs and charts are included. One conspicuous area is missing, however. Gone is the index of tube specifications and base diagrams. The token coverage of solid-state device specs has also been deleted.

One of the most repeatedly mentioned attributes of the *1979 Handbook* is the "Narrow Band Voice Modulation" chapter. The *Handbook*'s coverage of NBVM is largely a rehash of the *QST* articles and, in some cases, is a word-for-word reproduction. Experimenters looking for parts suppliers and discrete filter design information will be very disappointed.

In the enthusiasm for NBVM, such modes as RTTY, slow scan, and facsimile seem to have been forgotten. It is ironical that a book devoted to state of the art neglects even a short reference to these "specialized communications techniques" that many ham/experimenters are involved in. ARRL publications are sorely lacking in this area.

In keeping with the state-of-the-art theme, the FM and repeater chapter includes information on tone-decoding circuitry as well as a "practical synthesizer." However, there is no complete schematic for an FM transmitter or receiver. In this chapter as well as in most of the others, the editors have chosen to include many subcircuits dealing with a specific part of a rig.

The chapters on propagation, transmission lines, and antennas have been partially rewritten. Theory sections tend to be more mathematically oriented than earlier editions, while specific construction details are fewer.

If you are an "appliance operator" who doesn't care how your station works, then you may find the *Handbook* to be a waste of money. Highly knowledgeable hams looking for the latest in microprocessor control will probably be disappointed with the *1979 Handbook*. Beginners searching for a wire-by-wire description on building their first rig may be frustrated with the *Handbook*'s contents. Like its predecessors, the *1979 Radio Amateur's Handbook* is not a rigorous text on electronic theory; instead, it is a reference and idea book for hams willing to think.

**Tim Daniel N8RK**
**Oxford OH**

# FCC

*Reprinted from the* Federal Register.

### AMATEUR EXTRA CLASS LICENSE

**Eliminating Granting of Credit Toward the Telegraphy Portion of Examination to Former Holders of the Amateur Extra First Class License**

AGENCY: Federal Communications Commission.

ACTION: Notice of proposed rulemaking.

SUMMARY: The Commission is proposing to delete § 97.25(d) from its Rules. This provides credit toward the telegraphy portion of the Amateur Extra Class license examination to holders of the former Amateur Extra First Class license and its successor licenses.

DATES: Comments shall be filed by April 30, 1979, and Reply comments shall be filed by May 30, 1979.

ADDRESSES: Comments shall be filed with: Secretary, FCC, 1919 M Street, N.W., Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT:

Mr. Philip W. Savitz, Personal Radio Division, (202) 632-7175.

SUPPLEMENTARY INFORMATION:

Adopted: February 14, 1979.

Released: February 27, 1979.

By the Commission: Commissioner Quello absent.

1. In accordance with the Administrative Procedure Act, 5 U.S.C. 553, and § 1.412 of the Commission's Rules, the Commission hereby gives Notice of Proposed Rule Making in the above captioned matter.

2. During the period from June 1923 to June 1933 the Federal Radio Commission issued Amateur Extra First Class operator licenses. Subsequently, the equivalent license issued by the Federal Communications Commission was designated "Class A," and then "Advanced."

3. In 1952 the Commission created the Amateur Extra Class license. Obtaining this license requires successful completion of written examinations in nine areas of basic, general, intermediate and advanced amateur practice. These written examination requirements are much more stringent than those associated with the Amateur Extra First Class license. However, the telegraphy proficiency requirement for the Extra First license was 20 words per minute, which is the same as the current requirement for the Amateur Extra Class license.

4. Recognizing this identical telegraphy requirement, the Commission, in its Report and Order in Docket No. 19163, released on September 13, 1972, amended § 97.25(d) of its Rules to provide that credit for the telegraphy portion of the Amateur Extra Class examination be granted to applicants who present proof of having continuously held the Amateur Extra First Class license and its successor licenses.

5. Section 97.25(d) has now been in effect for more than six years. Recently, the number of persons seeking examination credit pursuant to this provision has declined to the point where such an application is now a rarity. As it appears that § 97.25(d) has become obsolete, the Commission is proposing its deletion from the Rules, effective six months from the adoption of such an order. This delay will give any former holder of the Amateur Extra First Class license who may remain a final opportunity to receive telegraphy credit toward the Amateur Extra Class examination.

6. The specific rule amendments we are proposing are set forth below. Authority for these proposals is contained in Sections 4(i), 5(e), and 303 of the Communications Act of 1934, as amended. We invite interested parties to submit comments concerning our proposals on or before April 30, 1979, and reply comments on or before May 30, 1979. An original and five copies of

all comments and reply comments shall be furnished the Commission, pursuant to §1.419 of the Rules. Respondents wishing each Commissioner to have a personal copy of the comments may submit an additional six copies. Members of the public wishing to express interest in our proposals but unable to provide the required copies may participate informally by submitting one copy of their comments, without regard to form, provided the correct Docket number is specified in the heading of the comments. All comments and reply comments filed in this proceeding should be sent to the Secretary, Federal Communications Commission, Washington, D.C. 20554.

7. Individuals wishing to inspect the comments and reply comments filed in this proceeding may do so during regular business hours, 8:00 A.M. to 5:30 P.M., Monday through Friday, in the Commission's Public Reference Room, 1919 "M" Street, N.W., Washington, D.C. 20554.

8. For further information contact Mr. Philip W. Savitz, Personal Radio Division, FCC, 1919 "M" Street, NW. Washington, D.C. 20554, (202) 632-7175.

FEDERAL COMMUNICATIONS
COMMISSION,
WILLIAM J. TRICARICO,
*Secretary.*

The Federal Communications Commission proposes to amend Part 97 of Chapter 1 of Title 47 of the Code of Federal Regulations as follows:

§97.25 [Amended]

1. In §97.25 paragraph (d) is deleted and paragraph (e) is redesignated as paragraph (d).

## PART 2—FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS: GENERAL RULES AND REGULATIONS

## PART 97—AMATEUR RADIO SERVICE

### Amendments of Rules Concerning the Northern Mariana Islands

AGENCY: Federal Communications Commission.

ACTION: Order (Rulemaking).

SUMMARY: The Northern Mariana Islands has recently been added to the Commission's jurisdiction. Certain charts and tables in the amateur rules are being amended to reflect this change in the Commission's jurisdiction.

EFFECTIVE DATE: March 13, 1979.

ADDRESSES: Federal Communications Commission, 1919 "M" St. NW., Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT:

Mr. Robert Cassler, Private Radio Bureau (202-634-6620).

SUPPLEMENTARY INFORMATION:

In the matter of amendments of Parts 2 and 97 of the Commission's rules concerning the Northern Mariana Islands.

Adopted: February 22, 1979.
Released: March 2, 1979.
By the Commission:

1. On January 9, 1978, as a step toward eventual political union with the United States as a Commonwealth, the Northern Mariana Islands came under the jurisdiction of those laws of the United States which have general applicability to the several States. Previously, these islands were administered by the United States for the United Nations as part of the Trust Territory of the Pacific Islands, and those persons seeking authorization to operate a radio station were required to apply to the High Commissioner of the Trust Territory of the Pacific Islands. As of January 9, 1978, the Communications Act of 1934, being a law of general applicability to the several States, became applicable to the Northern Mariana Islands, and jurisdiction over radio stations on the Northern Mariana Islands passed from the High Commissioner to the Federal Communications Commission.

2. Certain amendments to the rules governing the Amateur Radio Service in Parts 2 and 97 of the Commission's Rules are necessary to reflect the change of status of the Northern Mariana Islands. Two minor amendments to Parts 2 and 97 concern the frequency bands available to amateur radio operators on the Northern Mariana Islands. The Northern Mariana Islands lie in Region 3. Most of the rest of the United States lies in Region 2. International allocations for the Amateur Radio Service are different for Region 3 than for Region 2. Footnote NG62 to §2.106 and §97.61(b)(4) are being amended to reflect this.

3. The other two amendments concern the use of the 1800-2000 kHz amateur band. Because this band is shared with the radionavigation (LORAN-A) service, input power is limited according to geographic area. The charts in footnote NG15 to §2.106 and §97.61(b)(2) are being amended to add the Northern Mariana Islands to the list.

4. Authority for these rule changes is contained in Sections 4(i) and 303 of the Communications Act of 1934. Because these amendments are basically minor changes in the rules to reflect the addition of the Northern Mariana Islands to the Commission's jurisdiction, the Commission finds that, for good cause, the notice and public procedures provisions of the Administrative Procedure Act are unnecessary (5 U.S.C. 553(b)). For more information about these rule changes, contact Mr. Robert Cassler, Personal Radio Division, FCC, 1919 "M" Street, NW., Washington, D.C. 20554 (202-634-6620).

5. Accordingly, it is ordered that, effective March 13, 1979, Part 2 and Part 97 of the Commission's Rules are amended as set out in the Appendix.

(Secs. 4, 303, 48 Stat., as amended, 1066, 1082; 47 U.S.C. 154, 303.)

FEDERAL COMMUNICATIONS
COMMISSION,
WILLIAM J. TRICARICO,
*Secretary.*

### APPENDIX

Part 2 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:
1. In Section 2.106, footnote NG15, and footnote NG 62 are amended to read as follows:

§2.106 Table of frequency allocations.

* * * * * * *

NG15 * * *
(a) * * *
(4) * * *

MAXIMUM DC PLATE INPUT POWER IN WATTS

| Area | 1800-1825 kHz Day/Night | 1825-1850 kHz Day/Night | 1850-1875 kHz Day/Night | 1875-1900 kHz Day/Night | 1900-1925 kHz Day/Night | 1925-1950 kHz Day/Night | 1950-1975 kHz Day/Night | 1975-2000 kHz Day/Night |
|---|---|---|---|---|---|---|---|---|
| * | * | * | * | * | * | * | | |
| Baker, Canton, Enderbury, Howland | 100/25 | 0 | 0 | 100/25 | 100/25 | 0 | 0 | 100/25 |
| Guam, Johnston, Midway, Northern Mariana | 0 | 0 | 0 | 0 | 100/25 | 0 | 0 | 100/25 |
| American Samoa | 200/50 | 0 | 0 | 200/50 | 200/50 | 0 | 0 | 200/50 |
| * | * | * | * | * | * | * | | |

NG62 Consistent with Resolution 10, Radio Regulations, Geneva, 1959, interregional amateur contacts in this band should be limited to that portion between 7000 and 7100 kHz. In the band 7100 to 7300 kHz, the provisions of No. 117 of the Radio Regulations, Geneva, 1959, are applicable. In addition, 7100 to 7300 kHz is not available in the following U.S. possessions: Baker, Canton, Enderbury, Guam, Howland, Jarvis, Northern Mariana Islands, Palmyra, American Samoa and Wake Islands.

* * * * * * *

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:
2. In Section 97.61, paragraphs (b)(2) and (b)(4) are amended to read as follows:

§97.61 Authorized frequencies and emissions.

* * * * * *

(b) * * *
(2) * * *

MAXIMUM DC PLATE INPUT POWER IN WATTS

| Area | 1800-1825 kHz Day/Night | 1825-1850 kHz Day/Night | 1850-1875 kHz Day/Night | 1875-1900 kHz Day/Night | 1900-1925 kHz Day/Night | 1925-1950 kHz Day/Night | 1950-1975 kHz Day/Night | 1975-2000 kHz Day/Night |
|---|---|---|---|---|---|---|---|---|
| * | * | * | * | * | * | * | | |
| Baker, Canton, Enderbury, Howland | 100/25 | 0 | 0 | 100/25 | 100/25 | 0 | 0 | 100/25 |
| Guam, Johnston, Midway, Northern Mariana | 0 | 0 | 0 | 0 | 100/25 | 0 | 0 | 100/25 |
| American Samoa | 200/50 | 0 | 0 | 200/50 | 200/50 | 0 | 0 | 200/50 |
| * | * | * | * | * | * | * | | |

(4) 3900-4000 kHz and 7100-7300 kHz are not available in the following U.S. possessions: Baker, Canton, Enderbury, Guam, Howland, Jarvis, the Northern Mariana Islands, Palmyra, American Samoa and Wake Islands.

# Ham Help

An obviously demented *73* author is looking for 455-kHz i-f components. These may be anything from standard i-f transformers to moderately-priced crystal and ceramic filters.

They must be easily applied and usable with a wide range of solid-state devices, from junkbox transistors to IC devices—also, with tubes if possible. They must give good results in an i-f strip used for CW and/or SSB receiver use.

Manufacturers, distributors, or surplus dealers foolish enough to provide me with technical info, application notes, and an easy way for *73* readers to get their hands on the goodies may find themselves pestered unmercifully by *73* readers wanting to purchase parts to see if the circuit really works.

**Alexander MacLean**
**WA2SUT/NNN0ZVB**
**18 Indian Spring Trail**
**Denville NJ 07834**

I need help in converting a Drake TR-3 to semi-break-in CW. I feel that there must be some circuits for this obvious improvement of the TR-3 which possibly appeared in ham magazines in the 60s.

At present, my 15-year-old TR-3 must be manually switched between transmit and receive. The successor to the TR-3, the TR-4, injects a tone into the grid of the VOX amplifier circuit. Possibly, the same may be accomplished with the TR-3.

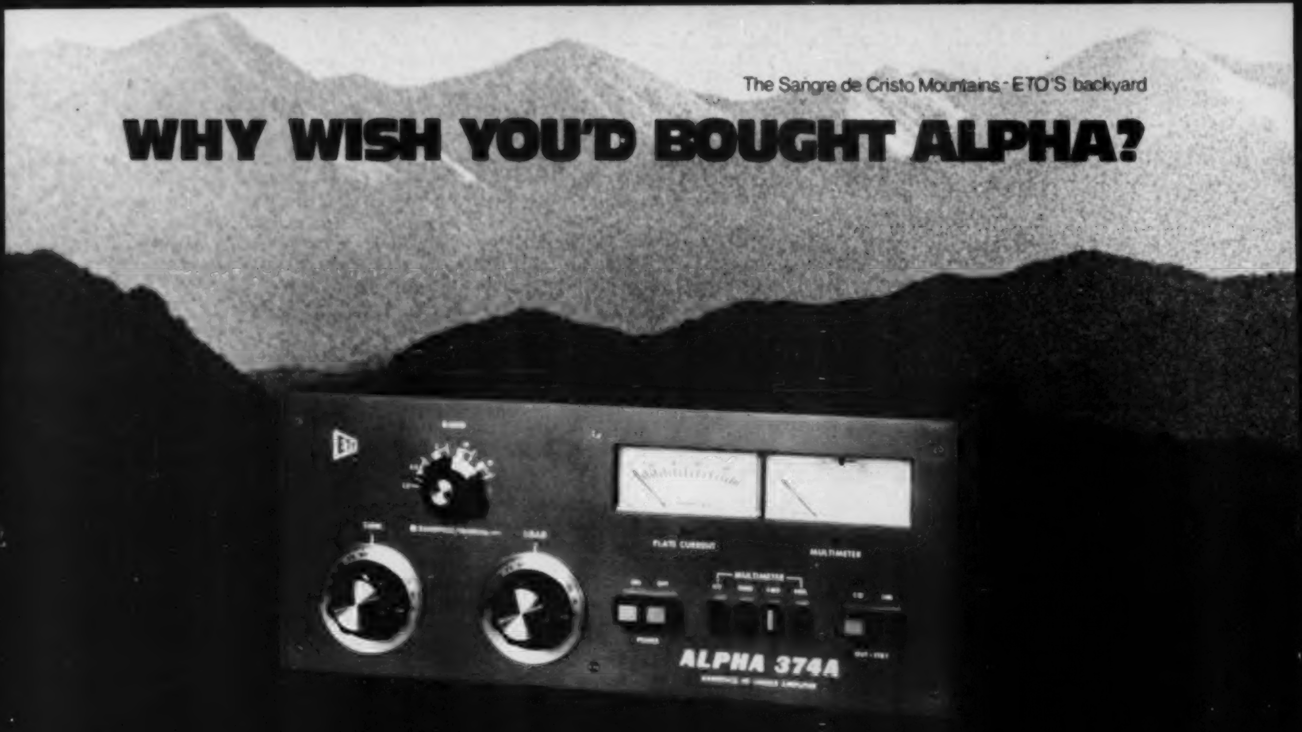
**Ron Yokubaitis WB5TKQ**
**PO Box 3554**
**Austin TX 78764**

I need the RCA manual sections for the high-band CMC-60 FM 60-Watt "boat anchor" rig (transmitter and dynamotor power supply only). I will duplicate and return within one week.

**Jack Myers W3RU**
**5740 Auberger Dr.**
**Fairfield OH 45014**
**(513)-829-0511**

I need help with an SR-C802—the schematic diagram or owner's manual, preferably.

**Walt Persans WA2ZBE**
**135 Roe St.**
**Staten Island NY 10310**



The Sangre de Cristo Mountains - ETO'S backyard

# WHY WISH YOU'D BOUGHT ALPHA?

## IS SOMETHING ELSE "JUST AS GOOD?"

New **ALPHA** owners often tell us, *"I wish I'd saved my time and money and bought an* ***ALPHA*** *in the first place."* Why not benefit from their experiences? Compare first!

**TRY TO GET ANY OTHER MANUFACTURER TO TELL YOU - IN WRITING - THAT IT'S SAFE TO OPERATE HIS DESK TOP LINEAR AT A FULL D-C KILOWATT . . . SAY FOR 24 HOURS KEY-DOWN. OR, ASK HIM FOR A FULL YEAR WRITTEN WARRANTY. LOTS OF LUCK!**

**YOUR NEW *ALPHA* WILL HAPPILY AND COOLY RUN THAT KILOWATT KEY-DOWN . . . FOR 24 DAYS IF YOU WISH. AND YOU'LL BE PROTECTED BY ETO'S UNMATCHED WARRANTY FOR TWO YEARS. WE PUT IT IN WRITING ALL THE TIME. IT'S THE WAY WE BUILD AND WARRANT EVERY *ALPHA*!**

---

The new **ALPHA's** are the best we've ever built. Nothing else even approaches an **ALPHA's** combination of power, convenience, quality, and owner protection. The ETO/**ALPHA** two year limited warranty offers you eight times as much protection as the industry standard 90 day warranty.

The new **ALPHA 374A** adds NO-TUNE-UP operation to all the other traditional ALPHA qualities and capabilities. You can hop instantly from one HF band to another, with full maximum legal power and with little or no amplifier tune-up at all! (If new amateur bands are added, you can manually adjust your **ALPHA** to work them, too.)

In 1974 the original **ALPHA 374** set a standard of high power convenience that has remained unmatched since. Despite its small size, not even one '374 owner ever burned out a power transformer. Impressive? The new '374A has an even huskier power supply. And it has ETO's ducted-air system with acoustically-isolated centrifugal blower to insure cool, whisper-quiet operation.

Before you get serious about any other brand of linear, compare its convenience and quality, its transformer heft, its cooling system efficiency and noise level - and its warranty - with the **ALPHA's.** Be sure to ask around about its reputation.

Call or write for detailed literature and thoroughly check out all the great new **ALPHA's** . . . so you don't make a mistake.

ETO

EHRHORN TECHNOLOGICAL OPERATIONS, INC.
BOX 708, CAÑON CITY, CO 81212 (303) 275-1613

# Contests

*from page 21*

*AWARDS:*

The ITU Trophy will be awarded to the country which earns the highest number of points computed as described above. The country which wins for 3 consecutive years or 5 interlaced years will remain in possession of the trophy. The trophy will be awarded to the representative national association of radio amateurs of the winning country. Gold, silver, and bronze medals will be awarded to the 3 highest-scoring radio amateurs in the world on each mode. Certificates will be awarded to the highest-scoring radio stations in each country on each mode. Depending on the number of contestants in each country, the contest committee will consider more certificates.

*ENTRIES:*

Logs will be filled out separately for each mode. Logs will follow the standard form and must be mailed before 30 June 1979. Address entries to: LABRE, UIT Contest Coordination, PO Box 07-0004, 70.000—Brasilia, DF, Brazil. Logs received after August 30 will not be computed for awards. Include a QSL, a self-addressed label, and IRCs for personal contest results. Note: Look for special ITU calls worldwide!

## ARMED FORCES DAY
## May 19, 1979

This year's observance of Armed Forces Day marks three decades of communications tests between the amateur radio fraternity and military communications systems. Since 1950, this event has been scheduled during the month of May and has emphasized a continuing climate of mutual assistance and warm esteem. Saturday, May 19, 1979, has been designated as the 30th Annual Armed Forces Day.

| Transmitting Station | Frequencies (kHz) |
|---|---|
| NAM<br>U.S. Navy Communications Area<br>Master Station, Norfolk VA | 4005, 7380, 14400 |
| GXH<br>U.S. Navy Communication Station<br>THURSO, Scotland, United Kingdom | 7394, 14520 |
| NPG<br>U.S. Navy Communication Station<br>Stockton CA | 4010, 7347.5, 13922.5 |
| NDT<br>U.S. Navy Communication Station<br>Yokosuka, JA | 7430, 15500 |
| WAR<br>Headquarters, U.S. Army<br>Washington, D.C. | 4030, 6997.5, 14405 |
| AIR<br>2045th Communications Group<br>Andrews Air Force Base<br>Washington, D.C. | 4025, 7315, 13997.5 |

*Table 2.*

| Station | Military Frequency (kHz) | Emission | Appropriate Amateur Band (MHz) |
|---|---|---|---|
| NAV<br>Headquarters, Navy-Marine Corps MARS<br>Washington, D.C. | 7385 | RTTY | 7.00-7.050 |
| | 14455 | RTTY | 14.25-14.35 |
| | 13975.5 (13973) | SSTV | 14.225-14.250* |
| NNN0NCG<br>US Coast Guard<br>MARS Radio Station<br>Alexandria VA | 4005 | CW | 3.5-3.65 |
| | 6970 (6971.5) | LSB | 7.050-7.100 |
| | 14385 | CW | 14.0-14.1 |
| | 20988.5 (20987) | USB | 21.25-21.45 |
| NNN0NHZ<br>CINCLANTFLT MARS<br>Radio Station<br>Norfolk VA | 7380 (7381.5) | LSB | 7.2-7.3 |
| | 14440 (14398.5) | USB | 14.1-14.25 |
| WAR<br>Headquarters, US<br>Army MARS<br>Washington, D.C. | 4001.5 | CW | 3.5-3.75 |
| | 4020 (4021.5) | LSB | 3.775-4.0 |
| | 4030 | RTTY | 3.65-3.775 |
| | 6997.5 | CW | 7.0-7.15 |
| | 14405 | CW | 14.0-14.2 |
| | 20994 (20992.5) | USB | 21.25-21.45 |
| AIR<br>U.S. Air Force MARS/<br>SITFA Radio Station<br>Washington, D.C. | 4025 (4026.5) | LSB | 3.9-4.0 |
| | 7305 (7306.5) | LSB | 7.25-7.30 |
| | 7315 | CW | 7.025-7.20 |
| | 13977.5 | CW | 14.025-14.20 |
| | 14397 (14398.5) | USB | 14.275-14.350 |
| NPG<br>Navy Communication<br>Station<br>Stockton CA | 4001.5 (4003) | LSB | 3.775-4.0 |
| | 4005 | CW | 3.5-3.65 |
| | 4010 | CW | 3.65-3.75 |
| | 6989 | CW | 7.00-7.025 |
| | 7301.5 (7303) | LSB | 7.025-7.050 |
| | 7365 | CW | 7.050-7.075 |
| | 14375 | CW | 14.00-14.025 |
| | 20983 | CW | 21.0-21.2 |
| | 20998.5 (20997) | USB | 21.27-21.40 |
| NNN0MET<br>USMC Air Station MARS<br>Radio Station<br>El Toro CA | 7347.5 | RTTY | 7.075-7.1 |
| | 13922.5 | RTTY | 14.075-14.1 |
| NPL<br>Navy Communication<br>Station<br>San Diego CA | 14390.5 (14389) | SSTV | 14.225-14.250* |

*SSTV from NAV will run from 1300-2100 UCT 19 May 1979
**SSTV from NPL will run from 1600-2400 UCT 19 May 1979

*Table 1.*

A featured highlight of the nationwide celebration will be the traditional military-to-amateur crossband communications tests. These tests give amateur operators an opportunity to demonstrate their individual technical skills and to receive recognition from the Secretary of Defense or the appropriate military radio station for their proven expertise.

The proceedings will include operations in continuous wave (CW), single sideband voice (SSB), radioteletype (RTTY), and slow-scan television (SSTV).

Special commemorative QSL cards will be awarded to amateurs achieving a verified two-way radio contact with any of the participating military radio stations. Those who receive and accurately copy the Armed Forces Day CW and/or RTTY message from the Secretary of Defense will receive a special commemorative certificate from the Secretary. Interception by shortwave listeners (SWLs) is not acknowledged by QSL cards; however, anyone can qualify for a certificate by copying the Secretary's message.

### Crossband Radio Contacts

The military-to-amateur crossband operations will be conducted from 19/1300 UCT (Universal Coordinated Time) to 20/0245 UCT May 1979. Military stations will transmit on selected military frequencies and listen for amateur stations on those portions of the amateur bands indicated in Table 1. The military operator will specify the particular frequency in the amateur band to which he/she is listening. Duration of the contact should be limited to three minutes.

### CW Receiving Test

The CW Receiving Test will be conducted at 25 words per minute. The broadcast will be a special Armed Forces Day message from the Secretary of Defense to any amateur operator desiring to participate. A ten-minute CQ call for tuning purposes will begin at 20/0300 UCT. The Secretary of Defense message will be transmitted at 20/0310 UCT from the stations on the listed frequencies in Table 2.

### RTTY Receiving Test

The Radioteletype (RTTY) Receiving Test will be transmitted at 60 words per minute. Radio station "AIR" will transmit using 850 Hertz (wide) shift. All other stations will transmit using 170 Hertz (narrow) shift. A ten-minute CQ call for tuning purposes will begin at 20/0335 UCT. The special Armed Forces Day message from the Secretary of Defense will be transmitted at 20/0345 UCT. This test is to exercise the technical skill of the amateur operator in aligning and adjusting equipment. Transmission will be from the same stations and on the same frequencies as listed for the CW Receiving Test.

### Submission of Test Entries

Transcriptions should be submitted "as received." No attempt should be made to correct possible transmission errors.

Time, frequency, and callsign of the station copied as well as the name, callsign, and address (including zip code) of the individual submitting the entry must be indicated on the page containing the message text. Each year, a large number of acceptable copies are received with insufficient identification information, or the necessary information was attached to the transcript and became separated, thereby precluding the issuance of a certificate.

Entries should be submitted to the appropriate military command and postmarked no later than 25 May 1979.

Stations copying NAM, GXH, NPG, or NDT submit entries to: Armed Forces Day Test, Chief, Navy-Marine Corps MARS, Bldg 13, NAVCOMMU WASHINGTON, Washington, D.C. 20390.

Stations copying WAR submit entries to: Armed Forces Day Test, Commander, United States Army Communication Command, ATTN: CC-OPS-MARS, Fort Huachuca AZ 85613.

Stations copying AIR submit entries to: Armed Forces Day Test, 2045th COMM GP/DONV, Andrews Air Force Base, Washington, D.C. 20331.

### MASSACHUSETTS QSO PARTY

**Starts: 1200 GMT May 19**
**Ends: 2200 GMT May 20**

This year's contest is sponsored by the Greater New Bedford Contesters. A station may be worked once per band, with phone and CW being separate bands for the purposes of this contest. No crossband or repeater contacts are permitted. Mobiles and portables may be counted as new contacts each time a county change takes place. DX stations count for QSO points only when worked by MA stations.

*EXCHANGE:*

RS(T) and MA county or state/VE province.

*SCORING:*

All stations count 2 points for each completed SSB exchange, 4 points for each CW exchange. MA stations multiply QSO points by total MA counties worked plus states and provinces worked. Out-of-state stations multiply QSO points by total number of MA counties worked. As an added bonus, add 5 points to your total score for each sponsor station worked (W1FJI, N1AS, K1KJT); sponsors can only be worked once for bonus points.

*AWARDS:*

Certificates will be awarded to 1st, 2nd, and 3rd place winners in each MA county as well as each state. Two special awards will be given—one to the ARC with the highest aggregate score in MA (min. of 3 logs), and a second award to the station in MA who submits the all-time highest number of QSOs (now held by N1YY at 664 QSOs in 1978). In addition, a certificate will be given to stations working all 3 sponsors.

*SUGGESTED FREQUENCIES:*

CW only—1810, 3560, 3720, 7060, 7120, 14060, 21060, 21120, 28060, 28120.

Phone only—1820, 3960, 7260, 14290, 21390, 28590, 50.110.

Use of FM simplex is encouraged; CW must be in CW bands only!

*LOGS & ENTRIES:*

Logging must conform to FCC rules—date, time, band, mode, callsign, state and province worked, exchange RST. Submit separate summary sheet along with logs. Summary sheet information: name, call, mailing address, club affiliation for aggregate score, total QSO points, multipliers, and total score. Deadline for mailing is June 30. For awards and results, send an SASE to Arthur Marshall W1FJI, 60 Meadow Rd., Westport MA 02790.

### MICHIGAN QSO PARTY

**Contest Periods**
**1800 GMT Saturday, May 19 to 0300 GMT Sunday, May 20**
**1100 GMT Sunday, May 20 to 0200 GMT Monday, May 21**

Sponsored by the Oak Park ARC with phone and CW combined into one contest. Michigan stations can work MI counties for multipliers. A station may be worked once on each band/mode. Portable/mobiles may be counted as new contacts each time county changes.

*EXCHANGE:*

RS(T), QSO number, QTH = MI county or state/country.

*SCORING:*

Multipliers are counted only once. MI stations score 1 point per QSO times sum of states, countries, and MI counties on phone. Each CW contact is 2 points per QSO. KL7 and KH6 count as states. VE counts as a country. Max. multiplier is 85. Non-MI stations score QSO points times number of MI counties. QSO points are as follows: 1 pt. for each MI phone QSO, 2 points each CW QSO, 5 points each club station contact W8MB. Max. multiplier is 83. VHF-only entries same as above except multipliers per VHF band are added together for total multipliers. No repeater contacts allowed, but 5 points for each OSCAR QSO.

*FREQUENCIES:*

CW—1810, 3540, 3725, 7035, 7125, 14035, 21035, 21125, 28035, 28125.

Phone—1815, 3905, 7280, 14280, 21380, 28580.

VHF—50.125, 145.025.

*AWARDS:*

Only single-operator stations qualify. MI trophies to high MI score, high MI (upper peninsula) score, high aggregate club score. Plaque to high VHF-only entry and high mobile. Certificates to high score in each county with minimum of 30 QSOs. Out of state—high out-of-state trophy and certificates for high score in each state and country.

*ENTRIES:*

A summary sheet is requested showing the scoring and other pertinent information, name and address in block letters, and a signed declaration that all rules and regulations have been observed. MI stations include club name for combined club score. Party contacts do not count toward the MI Achievement Award unless one fact about MI is communicated. Members of the MI Week QSO Party Committee are not eligible for individual awards. Decisions of the contest committee are final. Results will be final on July 31 and will be mailed to all entries. Mailing deadline is June 30, 1979, to: Mark Shaw K8ED, 3810 Woodman, Troy MI 48084.

### ACHIEVEMENT CERTIFICATES

1979 will be the 21st year that hams have had their own program to publicize Michigan and its products. Just as for the past 20 years, the Governor will award Achievement Certificates to hams who take an active part in telling the world of Michigan's unlimited resources, opportunities, and advantages.

Certificates are awarded on the following basis:

1) A MI ham submits log information and names and addresses (if possible) of 15 or more contacts made to out-of-state or DX hams with information regarding MI.

2) An out-of-state ham, including Canada, submits log information and names and addresses (if possible) of at least 5 MI hams who relate facts to him about MI.

3) A foreign ham, excluding any resident of Canada, submits the call letters and name/address plus log information for at least 1 MI ham who has told him about MI.

4) Only QSOs made during MI Week, May 19-26, will be considered valid!

All applications for certificates must be postmarked by July 1 and mailed to Governor William Milliken, Lansing MI 48902.

For your information, the state bird = robin, fish = trout, flower = apple blossom, state tree = white pine, stone = Petoskey Stone.

### PERSONAL COMMUNICATIONS ESSAY COMPETITION

The Personal Communications Foundation is pleased to announce its 1979 law student essay competition.

Any person who is a student in good standing at an ABA-accredited law school on February 15, 1979, is eligible to participate. Prizes of $500, $250, and $100 are being offered. In addition, the Foundation will endeavor to have the winning essays published in a national bar journal.

The general subject matter of the essay must deal with one or more of the legal aspects of personal communications by use of amateur radio, Citizens Band radio, monitors, and/or radar detectors. Within this area, suggested topics include, but are not limited to, constitutional issues, federal v. state and local regulation, effects upon property use and values, zoning and land-use considerations, and civil and/or criminal liabilities in connection with equipment operation (exclusive of FCC proceedings).

Essays may be of any length. They must be typed, double-spaced. Footnotes must appear at the end of the essay and conform to the current edition of *A Uniform System of Citation* published by Harvard Law Review Association.

All essays must be received

at the offices of the Personal Communications Foundation on or before October 1, 1979. Contestants must include, in addition to their name, mailing address, and telephone number, the name and address of their law school. Essays will be returned only if they are accompanied by a self-addressed, stamped envelope.

All entries will be judged by a committee of the Board of Trustees of the Foundation. The decision of the judges is final, and all entries will become the property of the Foundation. Winners will be announced no later than November 30, 1979.

The Personal Communications Foundation is a nonprofit California corporation dedicated to the collection and dissemination of legal research and information concerning personal communications. Its Board of Trustees is composed of lawyers, judges, and law-school professors who are licensed amateur radio and/or Citizens Band operators. Inquiries and essays should be addressed to Kenneth S. Widelitz, President, Personal Communications Foundation, 10960 Wilshire Boulevard, Suite 1504, Los Angeles, California 90024. Telephone (213)-478-1749.

### THE SASQUATCH AWARD

Sponsored by the Chilliwack Amateur Radio Club, the requirements are as follows: Eyeball contact with one Sasquatch, radio contact with two Sasquatch. Canadian and Continental US work six amateurs in the Chilliwack District, of whom three shall be club members. DX stations work five contacts, of which two shall be club members. Use all bands and all modes with all contacts made after March 1, 1979. The cost is $1.00 for VE/W, 3 IRCs for DX. Send log data only, QSLs not required. Apply to: Chilliwack Amateur Radio Club, c/o 317 Marshall Avenue, Chilliwack, BC, Canada V2P 3J5.

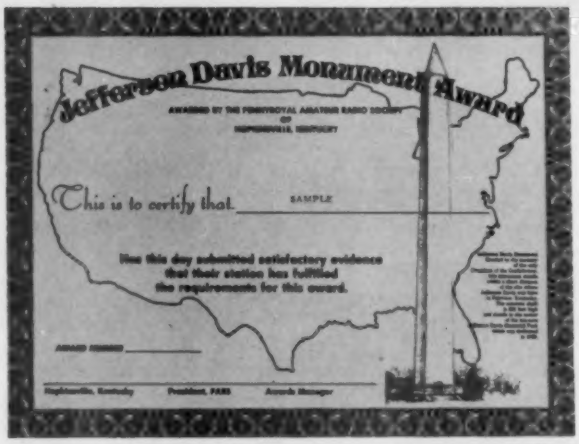
Chilliwack ARC Members: VE7s—AFA, AHN, AIO, AKD, AND, BEN, BHG, BYU, BZY, EWO, EX, FK, NHF, PU, QN, RS, TL, ZI. Local Area Calls (VE7s)—AGZ, AYZ, BBV, BDH, BIF, BLB, BPW, CBQ, CIO, CIW, CIX, CQO, GM.

### JEFFERSON DAVIS MONUMENT AWARD

The Pennyroyal Amateur Radio Society of Hopkinsville KY will be operating portable from the Jefferson Davis Memorial Park on June 3, 1979, from 0001 to 2359 GMT. This certified sequential award will be issued to any station presenting written confirmation of contact with a PARS member during the QSO period, or any ten Kentucky amateurs during the year. Awards may be obtained by sending $2.00 and the QSL cards to: PARS, PO Box 1077, Hopkinsville KY 42240. The QSL cards will be returned with the award. Frequencies to be monitored are as follows: Novice—3740, 21140, 28140; General—3970, 7270, 14310, 21370, 28610.

### NORTHERN LIGHTS AWARD

The Northern Lights Award is offered by the Northern Lights Chapter of the QCWA and is available only to members who are located outside the state of Alaska. Make contacts with three (3) members of the Northern Lights Chapter on any mode, any band, and any time after November 11, 1975. This is a one-time free award! Send a list of the three confirmed contacts, giving the date and time of the contacts to the secretary: J. W. "Mac" McQueen KL7AVX, 1928 East Dimond Blvd., Anchorage AK 99507.



Jefferson Davis Monument Award

This is to certify that ______ SAMPLE

Has this day submitted satisfactory evidence that their station has fulfilled the requirements for this award.

AWARD NUMBER ______

Hopkinsville, Kentucky — President, PARS — Awards Manager

### NOVICE WAS NET FORMING!

For anyone interested, a Novice WAS net is forming at 1400 GMT on Saturday mornings on 21.125 MHz. Net control stations are KA8AKL and WD8RUH. Check in with QTH and state(s) needed. Listen for QST WASN or NWASN to locate the net. For more information, contact Rick Todd KA8AKL, 14470 Basslake Rd., Newbury OH 44065.

### FAR SCHOLARSHIPS

The Foundation for Amateur Radio, Inc., a nonprofit organization with its headquarters in Washington DC, announces its intent to award six scholarships for the academic year 1979-80. All amateurs holding a license of at least the FCC General Class or equivalent can compete for one or more of the awards if they plan to pursue a full-time course of studies beyond high school and are enrolled in or have been accepted for enrollment in an accredited university, college, or technical school. The scholarship awards range from $250 to $800, with preference given in some of them to residents of various areas.

Additional information and an application form can be requested by letter or postcard, postmarked prior to June 1, 1979, from: FAR Scholarships, 8101 Hampden Lane, Bethesda MD 20014.

The Foundation is devoted exclusively to promoting the interest of amateur radio and scientific, literary, and educational pursuits which advance the purposes of amateur radio.

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# LETTERS

*from page 18*

*if 50 others would follow suit . . . for what? People who subscribe to QST get their money's worth in the magazine. If they are sending in the money to buy representation, then I think they are getting cheated. Sure, QST could be better . . . but it's certainly worth the subscription price, even at the new rate of $18 per year . . . which is about time.*

*If there are any 73 loyalists reading this, go soak your head. If there are any ARRL loyalists, go soak your head and leave it under.—Wayne.*

### THE HP3422

John M. Murray W1BNN
4 Kenwood Circle
Bloomfield CT 06002

Dear Mr. Murray,

I enjoyed your article in the January, 1979, edition of *73 Magazine* concerning the ship that sank off Haiti.

I have spent the last 3 years with the United States Coast Guard in San Juan, Puerto Rico, where I worked in communications and the Rescue Coordination Center (RCC). We handle approximately five hundred separate search and rescue cases each year under the direct control of the San Juan RCC. I do, however, remember the case of the HP3422, because of the part amateur radio played in saving these people's lives, and because I was on duty at the time of the incident and recall some of the procedures used.

The initial call for assistance was copied by an amateur radio operator in the States, who in turn notified the Coast Guard. Because time is usually a very important factor in rescue cases, the Coast Guard attempts to talk directly to the unit for locating, assisting, and other instructions, rather than using the longer and not-so-efficient relay method. Although we do have a number of club and personal amateur radio stations, in an emergency situation the FCC has allowed us to use any frequency with the distress unit providing it does not cause a problem with the defense of our country. In this particular case, the Coast Guard Communications Station, Portsmouth VA, was our initial radio unit in contact with the vessel. The Coast Guard has several teletype and telephone networks set up between the Navy, Air Force, other Coast Guard units, and civilian organizations in order to help perform our missions.

During this case, many different military organizations were used in the attempt to get assistance to this vessel. The Navy assisted with the direction-finding work, which they supplied to the rescue aircraft (to get it within 1 mile of vessel), the Air Force helped with aircraft, and the Coast Guard provided the major coordination and communications effort. So you see, even though it seemed that only one or two people were trying to get assistance and rescue these people, several different groups, including amateur radio operators, played an important part in the case.

I will not go into any more details concerning this incident, because my memory and the facts might tend to differ with each other. However, for your information, the people were picked up by a passing merchant vessel diverted to the scene to assist.

**James C. Norton WD8EAI**
**Cleveland OH**

## NOTHING PERSONAL

I like your magazine very much. It is probably the best ham publication on the market today! BUT . . . it's not worth $15 a year to me. The last time I subscribed, I got a three-year subscription for that amount.

I know what you are going to say. You're going to tell me how inflation has made the price go up and all that jazz. Well, that may be. I can't, however, keep paying what I believe to be an outrageous price. I'm sorry, OM, nothing personal.

**Clay Welsh W1PI**
**Springfield MA**

## VLF RECEPTION

I very much appreciated your fine editorial on Sam Harris. I had the W8FKC call from about 1948 to 1968 and knew Sam when he was at Brush Development in Cleveland and lived in Burton, Ohio. I used to work him on 144 and 220 from my former homes in Hudson and Chagrin Falls, Ohio, when the bands were dull. I built several paramps based on his designs and used them for moontracking the very first series of Ranger moon probes with a 28' dish. In fact, the paramp designs were the basis for my being interviewed for a position at Arecibo by Dr. Drake and others up at Cornell back in about 1964-65. I didn't get the job, which is just as well, because I did not really have enough expertise at the time. However, I was also on a year's leave of absence from OU here in 1966-67 with a position as station manager of the mm-wave dish supported by NRAO out at Kitt Peak AZ. I also spent a summer at Greenbank WV. All this was due in part to my interest and ability in VHF microwaves as a result of Sam Harris' work on low-noise amplifiers, etc., so I feel Sam had some influence over my career. I have graduated to the dc-to-500-kHz range now, teaching audio methods, supervising EE senior labs, and doing contract research on various NASA-, Signal Corps-, USCG-, and FAA-supported grants and contracts.

I enjoy reading 73 very much, although sometimes the quality of the technical work is not too good. A case in point was a recent article regarding VLF signal reception. In his article about a simple VLF converter (*73 Magazine*, January, 1979), W3QVZ mentioned the use of a 1000-foot (300-meter) longwire for WWVB, and only obtaining an estimated 20 uV at the input terminal. In theory, the 13-kW erp from WWVB at 60 kHz will develop a field intensity of about 100 uV/meter at W3QVZ's QTH in Woodbine, Maryland (see NBS Special Publication #432). Now, does this tell us that a 300-meter longwire strung out over the landscape only has an *effective height* of about 20/100 meters or *only 20 cm*? This, in fact, might be approximately true considering the input attenuation involved and the inherent difficulty of making accurate signal-strength estimates with a longwire antenna at VLF.

A longwire antenna system is just not the way to go at VLF. The antenna looks more like an extended groundwire, with much more capacitance to the variable noisy ground currents flowing in the earth than effective capacitance to the electric field above. Thus, the wire is picking up orders-of-magnitude more ground noise than signal. W3QVZ's comment that the antenna leaves much to be desired, even when used with a tuned circuit, is very true.

There is a much better approach to this problem of VLF signal reception. A 3-meter-or-so vertical whip antenna mounted up as high as possible and reasonably in the clear, with low capacitance to ground (but with a very good ground system at the receiver and underneath the antenna), can provide an effective height of 20 to 60 cm. In Ohio, I can receive WWVB 60 kHz with an estimated 150 uV/meter field intensity as developed on a 2¾-meter standard CB-type vertical whip. In order to operate a vertical, it is usually necessary to have a unity-voltage-gain, high-input-impedance circuit at the antenna base.

In my case, a preamplifier related to that presented in *73 Magazine* (May, 1978, pp. 146-153), has a measured input capacitance of 85 pF with no antenna connected. The 2¾-meter vertical has a capacitance of about 100 pF. The effective height is very roughly 100/(85 + 100) meters, or about 60 cm. I actually estimate about 90 uV for WWVB at the antenna terminal. If 90 uV is developed on an antenna with an effective height of 60 cm, then 100 cm (or a 1-meter theoretically perfect antenna) would develop about 150 uV. This approximately checks out with what WWVB says their 60-kHz signal level should be at my location in Ohio. The point to make here is that *3 meters up and vertical in the clear is better than 300 meters long over the bush.*

There are a multitude of other problems connected with operating vertical whip antennas, but they can be solved. In fact, these types of vertical antennas are now being used in military and marine VLF monitor systems for radio navigation throughout the world. The biggest single problem with all VLF E-field antennas is providing a really good ground system and relatively low capacitance to ground at the antenna terminal. In VLF reception, we are trying to measure the potential difference between what we think is our local ground system and an ideal probe sticking out into free space. A long horizontal wire does not solve the problem.

Another way of measuring antenna performance is to compare the actual height (or length) with the effective height. Thus the 2¾-meter vertical has an efficiency of [60 cm/(2.75 x 100 cm)](100) = 22%, and the 300-meter longwire has an efficiency of [20 cm/(300 x 100 cm)](100) = 0.07%, assuming all our measurements are correct. Even if we are off by a factor of ten, the short vertical antenna is still better!

Still another way of looking at the problem of a 300-meter longwire is to consider the height above ground. In the W3QVZ case, it was 60 feet, or about 20 meters, off the ground. The lead-in from this longwire may be a more effective antenna than the 300 meters of longwire. The horizontal wire adds so much capacitance directly to a noisy ground plane that it is degrading the performance of the height above ground. A good rule to follow in designing a "flattop" horizontal wire is to make the length about equal to the height and to place a buried counterpoise of radial wires in the ground underneath the whole antenna to provide a good earth ground. This is typically the type of antenna used for transmitting radio navigation beacons in the 150-kHz to 400-kHz range with a height and width of 15 to 20 meters. While the radiation efficiency is low for transmitting at these frequencies because of the very long wavelength, the receiving efficiency can be quite high in terms of effective height when used with a low-noise, high-input-impedance antenna coupler circuit.

An attempt at illustrating the problem of a longwire antenna with a low height-to-length ratio (as compared with a short vertical whip) is shown in Fig. 1. The downward point lines indicate the predominant coupling to the ground plane, and the dotted lines pointing upward show the coupling to the free-space electric field. In real-world antennas at low frequencies, it is often necessary to make a series of two-dimensional electrolytic tank experiments and plot the field contours by applying dc potential between an upper electrode and the bottom ground plane electrode containing the model antenna. The results are difficult to illustrate in two dimensions. Fig. 1 is a rough pictorial representation of the situation, not to any scale, to illustrate the idea of effective height (which is a purely mathematical concept). The main point we are trying to illustrate with all this is that it is important to have the probe (antenna)

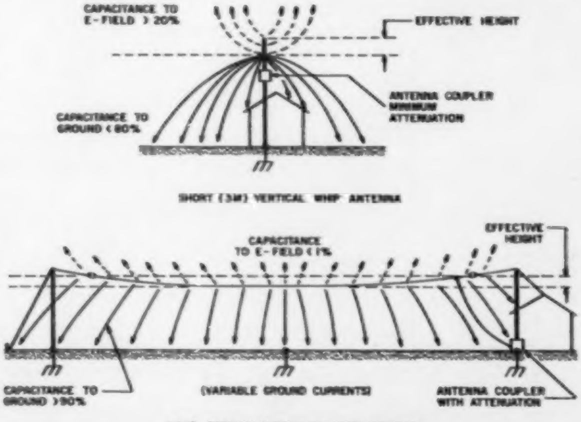
CAPACITANCE TO E-FIELD > 20%
EFFECTIVE HEIGHT
ANTENNA COUPLER MINIMUM ATTENUATION
CAPACITANCE TO GROUND < 80%
SHORT (3M) VERTICAL WHIP ANTENNA
CAPACITANCE TO E-FIELD < 1%
EFFECTIVE HEIGHT
CAPACITANCE TO GROUND >90%
(VARIABLE GROUND CURRENTS)
ANTENNA COUPLER WITH ATTENUATION
LONG (300M) HORIZONTAL WIRE ANTENNA

*Fig. 1. E-field pictorial representation of VLF antennas.*

out in the electric field as high as possible to minimize parallel capacitance and coupling to the local ground plane. In amateur work with VLF antennas, we should stop thinking about the way antennas work at 80 meters and up. Virtually all VLF E-field antennas are much shorter than a quarter wavelength. We should consider the antenna as more like placing a high-impedance probe at the end of a cable connected to an oscilloscope, with the high-Z circuitry at the antenna designed to minimize undesired noise pickup. (H-field loop antennas are a whole different story at VLF, suitable for some other author to present.)

Another aspect of W3QVZ's article on the VLF converter is the trouble experienced with cross-modulation. The use of an LM318 bipolar IC as a wideband input stage amplifier is prone to this problem. The input circuit, low-pass filter, and the input 10k summing resistor used with the LM318 operate as an attenuator for low-level signals. This decreases the signal even before it is amplified. It is not common practice to use operational amplifier methods at the very first input stage of a communications receiver. The signal-to-noise ratio is always decreased whenever an attenuation network is inserted between the source and the amplifier. A better input stage amplifier is a JFET MPF102 or 2N5457, each of which is much less susceptible to cross-modulation problems.

Good DX-hunting on VLF!

**R. W. Burhans**
**Athens OH**

## 227 MOD

As a member of Army MARS, I am grateful to KH6JMU for his work on expanding the frequency range of the Yaesu FT-227R Memorizer to include some MARS coverage (*73*, March, 1979).

Following his instructions, I removed the red wire from pin 3 and the blue wire from pin 7 on Q712 (MC14028B), located on the PLL control board (PB-1773A), and soldered them to a nearby ground. I found that the display became functional from 142.000 MHz to 149.995 MHz, as he indicated it would. The unit would transmit out-of-band below 144.000 MHz, but not above 147.995 MHz—which is required to work our local Army MARS repeater (148.01 in, 143.99 out).

After studying the diagram on page 19 of the owner's manual, I noted that although Q712 controls the low-end cutoff, Q711 (MC14081B) controls the high-end cutoff which must be overridden in order to transmit above 147.995 MHz.

The "fix" is very simple. All that is required is to cut a 1/16-inch gap in the foil leading from pin 10 on Q711 to D701, allowing Q713 to function properly above 148.000 MHz. This quick fix allows full transmit and receive functions from 142.000 to 149.995 MHz, including memory. (Would you believe 1600 channels?!)

Perhaps this 15-minute modification will make the FT-227R attractive to MARS members who were considering other alternatives.

**Mike Zoruba N8AIF**
**North Ridgeville OH**

## GENERATOR IMPROVEMENT

First off, thanks to Louis Hutton K7YZZ for the translation and Sr. Mario Scarpelli I6THB for his design, "The Italian Freq Generator" (January, 1979). I would like to suggest an improvement to prevent a "race" condition. Separate pin 13 of IC X5 and add an R-S flip-flop as shown in Fig. 2. This modification forces the "load" pulse to be equal to one half of the period of the generated signal, at least 50 ns at 10 MHz. Ten different 74192s were tried in the original circuit, with poor results above 5 MHz. With the modified circuit, the output signal is not "off 1 or 2 Hz at audio" and "several hundred Hz at MHz range," but is exactly "thumbwheel switch settings" plus "one" times the "multiplier switch" plus or minus the "reference oscillator error."

I had to add an additional 5 pF to the 33-pF and 100-pF capacitors to tune down to 3.400 MHz and 1.000 MHz respectively. Again, thanks for a good design, as I now have a signal generator which tunes from 0.993 Hz to 10.000 MHz with ± 1 ppm accuracy.

**Clancy Arnold W9AFV**
**Lawrence IN**

P.S. If you change IC X20 from a 7400 to 74S00 and use 2 unused gates of it for this modification, you add nothing to the parts count and gain an increase in drive power from 15 pF at 400 Ohms to 150 pF at 93 Ohms.

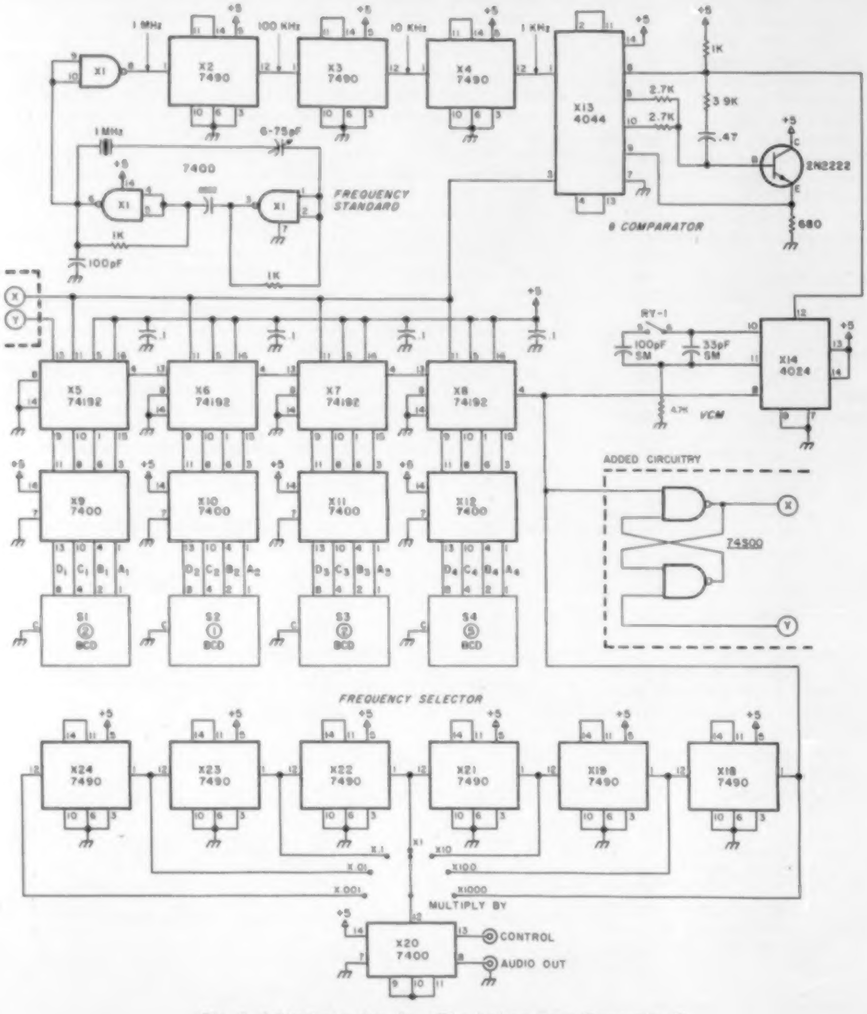

*Fig. 2. Added circuitry for "The Italian Freq Generator."*

## MEXICAN OPERATION

First, I thought I'd let you know how much I enjoy your magazine and how much I appreciate the fact that I can buy a subscription to it in Mexico for the same price as paid by stateside subscribers.

I thought some of your readers might be interested in knowing that there is now a *possibility* that licenses may be issued to visitors to Mexico. Until recently, only Mexican citizens were permitted to hold amateur licenses, and Mexico has no reciprocal agreements in force; however, due to a change in the regulations covering amateur operation in Mexico, permits may be issued up to a term of 6 months to persons visiting Mexico.

I would suggest that anyone interested in obtaining such a permit submit a request to: Secretaria de Comunicaciones Y Transportes, Subdireccion General de Permisos Y Asuntos Internacionales, Depto. de Frequencias Radioelectricas, Oficina de Licencias, Torre Central de Telecomunicaciones, Ave. Nino Perdido Y Cumbres de Aculzingo, Mexico 12, D.F., Mexico.

I suggest that a photocopy of the current license be included, as well as a copy of the Mexican tourist card (obtainable at the airline or travel agency offices) and a statement that "In accordance with Article 19, subsection b, of title 3, Regulations to Install and Operate Amateur Radio Stations as published in the Diario Oficial of July 4, 1977," you are requesting consideration of your request to be granted a temporary permit to operate. I would also suggest that a list of places to be visited, the approximate dates, and the equipment to be brought into the country be sent at the same time.

I cannot guarantee that this will get the applicant a permit, but at least such a possibility exists, for the first time.

**Kenneth M. Price XE1TIS**
**Irapuato, Mexico**

## PURE BODIES

In your editorial in the November, 1978, issue of *73*, you express concern about the effects of radar radiation absorbed as one drives down the highways of New Hampshire.

I submit that your concern is extremely parochial. You get zapped once every twenty miles or so. Consider the plight of those of us living on the heights just across the Hudson from the Big Apple—as one looks at the Empire State Building, one sees not only the TV antennas with their tremendous erp, but also all manner of dishes, yagis, corner reflectors, and horns aimed in our direction. And that is just a start—many other buildings from the Battery to uptown are also squirting a potpourri of rf our way. Of course, not all of this radiation is in the microwave region, but a good deal of it is—and many of those UHF TV channels are getting mighty close—and running lots of Watts.

I have no idea how much microwave energy I'm being subjected to, but if, as you claim, the highway dosage is 5000 times the amount of leakage allowed from microwave ovens, I'm sure I'm being subjected to a helluva lot more than that!

When you start your Church of the Pure Body, I think I'd be ready to become a convert. I'd then be able to protest the violation of my religious principles by all those rf sources across the river. Do you think we could get them to install a copper-screen rf fence along the top of our Palisades? As you say, if enough people protest, they can raise hell with the system. I don't want to move—I've lived here longer than the system has been imposing its rf on me. And the saddest part of all is that so much of the rf is being used to carry the pure unadulterated garbage that is the rule rather than the exception on the TV channels these days.

**Allen L. Barnett WB2QPM**
**Jersey City NJ**

## WRIST-COM

*Our January, 1979, issue contained a brief mention of a project to develop a "wrist radio" communications system. Since then, we've received an especially informative letter on the recent history of this concept. An excerpt from the letter appears below.*

The conclusion one draws from your comments is that NASA was the first to conceptualize and develop a functioning two-way wrist radio. I feel that it would be more to your advantage to provide full coverage regarding the actual facts in the development of a two-way wrist radio communication system beyond the representations provided by Chester Gould.

In late 1972 and into 1973, I developed a concept and then a breadboard working model of a sophisticated two-way wrist-worn communications system for deaf-blind persons which included digital on-board control, outputting of a number of different types of messages, and Morse code capability. It also provided for signaling back to a base station in cases of an emergency. We call it the "Wrist-Com." For one version of the Wrist-Com wireless signaling system, the "Institutional Wrist-Com," we required assistance in microminiaturization, and, because of their reputation and willingness to assist, we entered into an agreement with the Technology Utilization Office of NASA which would result in their producing for us a system which was based upon our design specifications and breadboard, and which would be usable at the Helen Keller National Center for Deaf-Blind Youths and Adults by our staff and clients, and elsewhere. More than four years have gone by since the original commitment was made, and NASA is still working on the project. (Since the original agreement, I have served as a technical consultant to NASA.)

I am quite disappointed that reports such as those occurring in *Microwave Systems News* and *73* should give so much publicity to a device which is merely an artist's conceptualization, when an actual system specifically designed to make use of a sophisticated two-way wrist radio and capable of satisfying many of the survival and signaling needs of severely handicapped people is presently being prototyped. Moreover, the prototype work is based on my designs developed here at the Helen Keller National Center. In light of the above, credit for the initial development of a practical two-way wrist communication system should be given to the Helen Keller National Center for Deaf-Blind Youths and Adults.

**Frederick M. Kruger, Ph.D.**
**K2LDC**
**Director of Research**
**Helen Keller National Center**
**Sands Point NY**

*Thanks for providing us with the proper background on the Wrist-Com idea. Best of luck with the project, Fred, and be sure to keep us up to date on your progress.—Jeff DeTray WB8BTH/1, Assistant Publisher.*

## HAD IT

I enlisted in the Navy in 1956, and ended up as a Radioman. In 1962, while on my one and only tour of shore duty, I was stationed with several amateurs, and a friend of mine had quite a collection of back issues of *CQ* and *QST*. I spent a lot of time reading and enjoying these old magazines, especially "Never Say Die" and "Scratchi." So, I went and got a General class license.

I spent many enjoyable hours working 20 CW from the small ham shack where I had the misfortune to be stationed. I ended up with a big bunch of QSL cards (all of which were acknowledged), and then went to a ship home-ported in a country without reciprocal privileges.

About this time, the subscription to *CQ* I had ordered finally caught up to me. Right away I opened it to W2NSD, only to find out it wasn't there; no Scratchi, either. Then I saw an editorial by the new editor, and the part that sticks in my memory after 15 years was something he wrote to the effect that there is no place in a ham magazine for levity. And that was why Wayne Green was no longer the editor. The next ten issues were passed on to my ham shipmates without being opened. Naturally, I never renewed that subscription.

At the same time, I let my membership in the ARRL lapse, mainly because of incentive licensing. I didn't mind working harder for something more, but it really ticked me off to lose what I already had.

In 1966, I became a submarine sailor. No chance for amateur radio there, but each time my license expired, I renewed it, thinking that one day I would be on the air again. In the meantime, I had tours on four submarines, in Viet Nam, and in Taiwan. Finally, in 1976, I retired from the Navy. During my career, I had been the leading Radioman in five different radio shacks, and only a Navy Radioman can tell you what that means to a Radioman. I had also managed to acquire a First Class Radiotelegraph license, and shortly after retiring, I received my Merchant Marine Radio Officer's license and Z-card. I did not, however, attempt to upgrade my amateur license, mostly because of a lack of interest.

Shortly after I retired, I received your offer of a three-year subscription at a special price, and I went for it. The first couple of issues got me thinking again, and over the past couple of years I have been doing quite a bit of soul-searching and discussing amateur communications with some of the amateurs I know.

I have now reached the conclusion that after twenty years as a professional radio communicator, I've had it. Amateurs today are the same as they were when I started. If you manage to get in contact with one of them, either they are looking for as many contacts as possible or, if they are interested in communicating (rag chewing), which is my bag, it seems like all they can talk about is what gear they are using. The fact that I can receive them at all tells me that they have an antenna, a transmitter, and some sort of electricity hooked up to it. If I ask about the weather, they don't know because they haven't been outside of the ham shack for the past week. If I ask about the liberty where they are, such as the night spots, local attractions, etc., the contact either fades, or the other guy comes on like the caretaker at the local monastery.

Well, now I have a job as a locomotive engineer. (That's the guy who runs the train.) I have a radio on my engine but I couldn't tell you what frequency it's on. I suspect it's around 160 MHz, on FM, but if it isn't, I'm not concerned. As a matter of fact, I'm not really all that concerned about whether it works or not. And that's the limit of my two-way communications.

If, as you fear, WARC takes away the amateur frequencies, I'm not going to mourn them. If I haven't made it clear why not, I'll spell it out here: incentive licensing. Once it went in, I went out and have stayed out.

Well, Wayne, I know this is the type of letter you don't like to receive, but it is how I feel. If you want to cancel my subscription now, that's okay. If not, I'll keep reading the magazines as they come until it runs out, but I won't be renewing it.

**Jack McCord KA4EXD**
**Arlington VA**

## OUT OF SIGHT

I have just returned from an ARRL convention/hamfest, where I attended an ARMA (Amateur Radio Manufacturer's Association) meeting at which most of the ARRL board of directors also sat in. Since ARMA allows manufacturers, dealers, reps, and publishers to be members, the ARRL was classified as a publisher and allowed to participate in the meeting. The meeting started with just a handful of manufacturers and dealers and the group of ARRL directors. The first words that came from the ARMA meeting moderator were, "It has been said that ARMA is anti-ARRL—this is not so." With that, you could hear a sigh of relief in the form of a wheeze from the elderly ARRL board members. The main topic of the meeting was the 220 band and what to do with it. They also talked about the 10 meter amplifier ban.

As some of you know, the ARRL has asked the FCC to allow the use of 220 for the Novice for phone, hoping to bring more users to the band. ARMA wants to start an all-new entry level exam for 220, with a code recognition test (3 to 5 wpm) and a Novice-type technical exam. The testing for the new class would be much like the Novice test, only the old term "Novice" would not be used. After all, who wants to be a novice at anything? The term "Communicator" will not be used either. They said that "communicator" sounds too much like CB and that the high emotional feeling of hams about that word would spell doom for the ARMA plan. So they have to come up with a name that all will go for.

ARMA then disclosed its plan of attack. It called for $30,000 to go for a lobbyist to push a $1.5 million FCC grant/funding pool for the "new class" license. ARMA said that the FCC had told them that if the money were appropriated, the new class could be on the air by midsummer of '79. With that came the big question—Will the ARRL back ARMA and their plan? Silence fell over the room. ARMA members were on the edge of their chairs, and all you could hear were the tapping of toes, the counting of fingers, and the scratching of heads coming from the ARRL leaders. Then came the big answer: Well, maybe, but off the record—we don't want to make anyone in the "fraternity" mad at us and lose members.

It seemed to me that the ARRL directors were looking after themselves as board members, but as elected representatives they were not doing their job in any way. Even the next day, at the ARRL membership meeting, the ARMA plan was not brought to light to the membership. If a phrase could be used to express the ARRL feelings on any issue that might have an impact on membership, it's "out of sight, out of mind."

**James W. Menefee, Jr. WA4KKY**
**Jacksonville FL**

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# FCC

*Reprinted from the* Federal Register.

## PART 97—AMATEUR RADIO SERVICE

### Editorial Amendment Concerning Application for Station License

AGENCY: Federal Communications Commission.

ACTION: Correction of final rule.

SUMMARY: FCC amends rule to correct error in paragraph sequence.

EFFECTIVE DATE: March 13, 1979.

ADDRESSES: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT:

Upton Guthery, Office of General Counsel, 202-632-6444.

In the matter of editorial amendment of §97.41 Rules of Practice and Procedure; Order.

Adopted: February 26, 1979.

Released: March 2, 1979.

1. To correct inconsistencies between the amendatory language and the paragraphing of the rule changes in two orders amending §97.41 of the Rules, we are issuing this order specifying the correct text of that section. The orders in question are FCC 78-76, 43 FR 7323, February 22, 1978, and FCC 78-210, 43 FR 15331, April 12, 1978.

2. Authority for this action is contained in Sections 4(i) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i) and 303(r), and §0.261(d) of the Rules, 47 CFR 0.261(d). Because the correction is editorial in nature, compliance with the prior notice and effective date provisions of 5 U.S.C. 553 is unnecessary.

3. Accordingly, it is ordered, effective March 13, 1979, That §97.41 is corrected to read as set forth below.

(Secs. 4, 303, 48 Stat., as amended, 1066, 1082; 47 U.S.C. 154, 303.)

R. D. Lichtwardt,
*Executive Director.*

In part 97 of Chapter I of Title 47 of the Code of Federal Regulations, §97.41 is corrected to read as follows:

**§97.41 Application for station license.**

(a) Each application for a club or military recreation station license in the Amateur Radio Service shall be made on the FCC Form 610-B. Each application for any other amateur radio license shall be made on the FCC Form 610.

(b) One application and all papers incorporated therein and made a part thereof shall be submitted for each amateur station license. If the application is only for a station license, it shall be filed directly with the Commission's Gettysburg, Pennsylvania office. If the application also contains an application for any class of amateur operator license, it shall be filed in accordance with the provisions of §97.11.

(c) Each applicant in the Safety and Special Radio Services (1) for modification of a station license involving a site change or a substantial increase in tower height or (2) for a license for a new station must, before commencing construction, supply the environmental information, where required, and must follow the procedure prescribed by Subpart I of Part I of this chapter (§§1.1301 through 1.1319) unless Commission action authorizing such construction would be a minor action with the meaning of Subpart I of Part I.

## PART 97—AMATEUR RADIO SERVICE

### Extending Grace Period for Renewal of an Expired Amateur Radio Service Operator License

AGENCY: Federal Communications Commission.

ACTION: Order (Rulemaking).

SUMMARY: The Amateur Radio Services rules are being amended to extend the grace period for renewal of an expired amateur radio license from one year to five years. At present, persons who do not renew within one year of the expiration of their license must be retested in telegraphy and radio theory. Extension of the grace period will reduce the number of re-examinations and/or requests for waiver of the re-examination requirement.

EFFECTIVE DATE: March 16, 1979.

ADDRESSES: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT:

Mr. Stephen J. Francis, Private Radio Bureau, (202-632-7175).

SUPPLEMENTARY INFORMATION:

Adopted: February 28, 1979.

Released: March 5, 1979.

*Order.* In the Matter of Amendment of Part 97 to extend grace period for renewal of an expired Amateur Radio Service operator license.

1. The purpose of this Order is to amend Part 97 of the Commission's rules to lengthen the "grace" period for renewal of an expired amateur radio operator license. Section 97.13(d) of the Commission's rules now states that, "If a license is allowed to expire, application for renewal may be made during a period of grace of one year after the expiration date. During this one year period of grace, an expired license is not valid."

2. Applicants who allow the one year period of grace to expire must normally be reexamined to demonstrate again their qualifications to be amateur radio operators. The Commission, however, receives many requests for waivers of §97.13(d) from applicants, who, for various reasons, have unknowingly permitted their licenses to lapse beyond the one year period of grace.

3. In considering whether or not to grant waivers of §97.13(d), the Commission evaluates the circumstances surrounding the non-renewal of these licenses. The rule is waived in cases when (1) circumstances beyond the licensee's control, such as a physical disability or a death of a close family member prevent the licensee from filing a timely application and (2) the period since expiration of the "grace period" has been of brief duration. When a waiver is granted, the Commission presumes the applicant is still fully qualified to operate an amateur station.

4. It is evident from experience gained in processing several hundred requests for waivers in recent years that the overwhelming majority of requests result in waivers. For this reason, the Commission is amending §97.13(d) to change the period of grace from one to five years. The Commission concludes that the five-year period is one in which it is reasonable to presume that the licensee will remain fully qualified. While there is no clear demarcation, we believe that an extension of this period beyond the equivalent of one additional license term is unwarranted.

5. The rule amendment will reduce Commission workload in two ways: (1) The Commission will receive fewer requests for waivers, each of which now require individual attention and handling; and (2) the Commission will administer fewer second examinations to ex-licensees who failed to renew their licenses within the "grace period".

6. Authority for these amendments is contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended. The Commission finds, that for good cause the prior notice and public procedure provisions of the Administrative Procedure Act (5 U.S.C. 553) are unnecessary because the Commission believes that there would be no objection to the relief from previously imposed restrictions. Early adoption would simplify application filing requirements, accelerate the speed for processing applications, and reduce delay in eliminating restrictions.

7. *It is ordered,* That effective March 16, 1979, Part 97 of the Commission's rules and regulations is amended as set forth below.

(Secs. 4, 303, 48 Stat., as amended, 1066, 1082; (47 U.S.C. 154, 303))

Federal Communications Commission,
William Tricarico,
*Secretary.*

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. In §97.13 paragraph (d) is revised to read as follows:

**§97.13 Renewal or modification of operator license.**

* * * * *

(d) If a license is allowed to expire, application for renewal may be made during a period of grace of five years after the expiration date. During this five year period of grace, an expired license is not valid. A license renewed during the grace period will be dated currently and will not be backdated to the date of its expiration. Application for renewal shall be submitted on FCC Form 610 and shall be accompanied by the applicant's expired license.

## AMATEUR RADIO SERVICE

### Terminating Proceeding Concerning Operator Classes, Privileges, and Requirements

AGENCY: Federal Communications

Commission.

ACTION: Termination of rule making proceeding.

SUMMARY: The Commission decides to defer action on the "Communicator Class" and "dual ladder" amateur licensing. A petition for "lifetime" issuance of the Amateur Extra Class license is denied; and action is deferred on changing the procedure for measuring amateur transmitter power.

EFFECTIVE DATE: Not applicable.

ADDRESSES: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT:

James E. McNally, Jr., Personal Radio Division, Private Radio Bureau, (202) 632-7175.

### THIRD REPORT AND ORDER—(PROCEEDING TERMINATED)

Adopted: March 6, 1979.

Released: March 14, 1979.

In the matter of amendment of Part 97 of the Commission's rules concerning operator classes, privileges, and requirements in the Amateur Radio Service, Docket No. 20282, RM-1016, 1363, 1454, 1456, 1516, 1521, 1526, 1535, 1568, 1572, 1602, 1615, 1629, 1633, 1656, 1724, 1793, 1805, 1841, 1920, 1947, 1976, 1991, 2030, 2043, 2053, 2149, 2150, 2162, 2166, 2216, 2219, 2256, 2284, 2449.

1. On December 16, 1974, the Commission issued a Notice of Proposed Rule Making in the above-entitled matter which was published in the FEDERAL REGISTER on December 20, 1974 (39 FR 44042). The major proposed rule changes contained in the Notice were the following:

(a) Creation of a 'dual ladder' licensing structure;

(b) Creation of a "Communicator Class" license having no telegraphy privileges or examination requirement;

(c) Establishment of new power limits based on transmitter peak envelope power output;

(d) New restrictions on licenses obtained by means of volunteer-administered mail examinations;

(e) Issuance of lifetime Amateur Extra Class operator licenses; and,

(f) Modification of the frequencies and modes available to certain license classes.

2. Because of severe manpower and time restrictions brought about by the huge surge in Citizens Band Radio Service applications since 1974, we were unable to undertake the preparation of a comprehensive Report and Order addressing all of the issues raised in the Notice. We did, however, release a First Report and Order on June 15, 1976 (41 FR 25013) which amended the rules to reflect the following changes:

(a) Except in cases where the applicant was physically disabled (and where the Commission would select the volunteer examiner), volunteer-administered examinations could only be given to applicants for the Novice Class license;

(b) The Conditional Class license and the "conditional" (C) limitation on the Technician Class license were to be eliminated upon renewal. Licensees holding the Conditional Class license were to be issued a regular General Class license, and holders of the Technician (C) Class license were to be issued regular Technician Class licenses;

(c) The 175 mile distance eligibility criteria for the General (formerly Conditional) Class license was eliminated;

(d) Applicants for any class of amateur license must take Element Two;

(e) Holders of the Technician Class license were given all Novice privileges; and,

(f) The maximum permissible input power for Novices was increased to 250 watts.

3. Subsequently, on April 6, 1978, we released a Second Report and Order (43 FR 15324) which gave holders of the Technician Class license full operating privileges above 50 MHz, and which changed the term of the Novice Class license from 2 years, non-renewable to 5 years, renewable.

4. The purpose of this Third Report and Order is to dispose of the remaining unresolved matters.

5. First, we have decided to take no action at this time on the 'dual ladder' licensing structure proposed in the Notice, or on the creation of a "Communicator Class" license having no telegraphy privileges or requirements. We firmly believe in the principle, articulated in the Notice, that in any licensing system there should be a logical relationship between the qualification requirements and the operator privileges authorized at each license class level. We feel that the "Communicator Class", as proposed, was in keeping with this principle; and we do not agree with the majority filing comments who asserted that the privileges to be conveyed by the "Communicator Class" were "out of proportion" to the qualification requirements. Nevertheless, since much time has elapsed since the issuance of the Notice (4 years), and since the Amateur Radio Service has grown about 50% in that time period (with many of the new licensees coming from the Citizens Band Radio Service), it is our belief that the comments, and perhaps even our original proposal, have become somewhat outdated. Then, too, tremendous growth has taken place in the citizens Band Radio Service (1400% in 4 years); and we would like to get the views of these newer licensees on the need or desirability of a "codeless" class of amateur license. Accordingly, we hope to revisit this matter later this year in a new rule making proceeding.

6. At this time, however, we will address the matter of lifetime issuance of the amateur Extra Class license (RM-2030). In the Notice, we proposed to adopt this request since our records indicated that very few amateurs drop out of amateur radio after they have attained the amateur Extra Class. We pointed out, however, that while section 303(L)(1) of the Communications Act of 1934, as amended, allows us to issue operator licenses for life, section 307(d) limits the term of the concomitantly issued station license to not more than 5 years. At best then, we would only be able to eliminate the need to retake the examination should the amateur neglect to renew his (or her) license.

7. In the years since the issuance of the Notice, however, we have become very sensitive to the adverse effects such "special case" consideration can have on our various personal (and amateur) radio service data processing systems. While we generally retain files containing information about expired licenses for periods in excess of 5 years after the expiration date, to maintain these files indefinately would be a new and burdensome requirement, particularly in view of the fact that very few people would be expected to take advantage of the lifetime non-examination renewal privilege. In a separate action, we have amended § 97.13 to extend the "grace period" for all classes of license from one to five years. This extension will accommodate a great variety of personal circumstances which has been the basis of requests for waiver of the "grace period"; and it is, in our opinion, an equitable alternative to a lifetime, non-examination renewal privilege. Accordingly, we have decided to take no additional action on this matter.

8. Lastly, the comments filed in response to our suggestion of establishing new power limits based on transmitter peak envelope power output were, in the main, negative. There were, however, several respondents who did suggest innovative alternatives to our proposal. While we have decided to take no further action on this matter at this time, we are still of the opinion that the state of present-day amateur communications warrants the use of better procedures to determine transmitter power than the "plate voltage times current" method. We intend to revisit this matter at a later time, and we encourage amateurs, in the interim, to develop and disseminate data which could be used as a basis for a workable and state-of-the-art measurement technique.

9. Accordingly, pursuant to the authority contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended: *It is ordered*, That this proceeding is terminated. Further information about this action by the Commission may be obtained by contacting Mr. James E. McNally, Personal Radio Division, FCC, 1919 M St., NW., Washington, D.C. 20554 (202-632-7175).

FEDERAL COMMUNICATIONS COMMISSION,
WILLIAM J. TRICARICO,
*Secretary.*

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# OSCAR Orbits

*Courtesy of AMSAT*

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

**Oscar 7 Orbital Information**

| Orbit | Date (May) | Time (GMT) | Longitude of Eq. Crossing °W |
|---|---|---|---|
| 20387 | 1 | 0043:48 | 73.8 |
| 20400X | 2 | 0138:05 | 87.4 |
| 20412 | 3 | 0037:25 | 72.2 |
| 20425X | 4 | 0131:42 | 85.8 |
| 20437 | 5 | 0031:02 | 70.6 |
| 20450 | 6 | 0125:19 | 84.2 |
| 20462qrp | 7 | 0024:40 | 69.1 |
| 20475 | 8 | 0118:57 | 82.7 |
| 20487X | 9 | 0018:17 | 67.5 |
| 20500 | 10 | 0112:34 | 81.1 |
| 20512 | 11 | 0011:54 | 66.0 |
| 20525 | 12 | 0106:11 | 79.6 |
| 20537 | 13 | 0005:31 | 64.4 |
| 20550qrp | 14 | 0059:48 | 78.0 |
| 20563 | 15 | 0154:05 | 91.6 |
| 20575X | 16 | 0053:26 | 76.4 |
| 20588 | 17 | 0147:43 | 90.0 |
| 20600 | 18 | 0047:03 | 74.9 |
| 20613 | 19 | 0141:20 | 88.5 |
| 20625 | 20 | 0040:40 | 73.3 |
| 20638qrp | 21 | 0134:57 | 86.9 |
| 20650 | 22 | 0034:17 | 71.8 |
| 20663X | 23 | 0128:34 | 85.4 |
| 20675 | 24 | 0027:55 | 70.2 |
| 20688 | 25 | 0122:12 | 83.8 |
| 20700 | 26 | 0021:32 | 68.6 |
| 20713 | 27 | 0115:49 | 82.2 |
| 20725qrp | 28 | 0015:09 | 67.1 |
| 20738 | 29 | 0109:26 | 80.7 |
| 20750X | 30 | 0008:46 | 65.5 |
| 20763 | 31 | 0103:03 | 79.1 |

**Oscar 8 Orbital Information**

| Orbit | Date (May) | Time (GMT) | Longitude of Eq. Crossing °W |
|---|---|---|---|
| 5877Abn | 1 | 0039:21 | 53.8 |
| 5891X | 2 | 0044:32 | 55.1 |
| 5905Abn | 3 | 0049:43 | 56.4 |
| 5919Abn | 4 | 0054:54 | 57.7 |
| 5933Jbn | 5 | 0100:05 | 59.0 |
| 5947Jbn | 6 | 0105:16 | 60.3 |
| 5961Abn | 7 | 0110:27 | 61.7 |
| 5975Abn | 8 | 0115:38 | 63.0 |
| 5989X | 9 | 0120:49 | 64.3 |
| 6003Abn | 10 | 0126:00 | 65.6 |
| 6017Abn | 11 | 0131:11 | 66.9 |
| 6031Jbn | 12 | 0136:22 | 68.2 |
| 6045Jbn | 13 | 0141:33 | 69.5 |
| 6058Abn | 14 | 0003:31 | 45.0 |
| 6072Abn | 15 | 0008:42 | 46.3 |
| 6086X | 16 | 0013:53 | 47.6 |
| 6100Abn | 17 | 0019:04 | 49.0 |
| 6114Abn | 18 | 0024:14 | 50.3 |
| 6128Jbn | 19 | 0029:25 | 51.6 |
| 6142Jbn | 20 | 0034:36 | 52.9 |
| 6156Abn | 21 | 0039:47 | 54.2 |
| 6170Abn | 22 | 0044:58 | 55.5 |
| 6184X | 23 | 0050:09 | 56.8 |
| 6198Abn | 24 | 0055:20 | 58.1 |
| 6212Abn | 25 | 0100:31 | 59.4 |
| 6226Jbn | 26 | 0105:41 | 60.8 |
| 6240Jbn | 27 | 0110:52 | 62.1 |
| 6254Abn | 28 | 0116:03 | 63.4 |
| 6268Abn | 29 | 0121:14 | 64.7 |
| 6282X | 30 | 0126:25 | 66.0 |
| 6296Abn | 31 | 0131:35 | 67.3 |

# DX

*from page 13*

about evenly between CW and SSB. They were active for three weeks and operated during the CQ-WW 160 Meter Contest.

Amateur radio operators in Sweden and the U.S. will attempt direct contact between Bishop Hill, Illinois, and Biskopskulla, Uppland, Sweden, during the weekend of May 26th and 27th. Bishop Hill was a communal settlement established in the 1840s by Swedish immigrants, and is now a historical site maintained by the state of Illinois. Led by W9FKC and SM0FY, the two groups will contact as many stations as possible during the time period. Special QSLs will be issued, and SASEs are requested. QSL to WA9AQN.

The Wiesbaden Amateur Radio Club will be going on a DXpedition to Lichtenstein from 26 May to 3 June. They will be using the callsign HB0XAA. The frequencies they will be using are: 3.780, 7.090, 14.280, 21.350, 28.650 SSB, and 25 Hz up from the bottom for CW. For the Novices, some of them will try to get on at other times, but nothing is scheduled so far. The QSL manager will be Hugo Jakobljevich DJ0LC, Am Weinberg 10, 6201 Auringen.

## BEATA ISLAND

The following letter from Tim HI8MFP wraps up the recent HI1RCD operation from Beata Island:

"The Beata DXpedition was a success, with more than three thousand contacts in 52 hours of operation. Fifty-three countries were contacted. The first contact took place at 2045 GMT on the 25th, and the last was made at 1234 GMT on the 28th.

"The trip on the boat to the island was excellent. We left the island six hours before the set time, on the recommendations of Navy authorities who said they were expecting changes in the water currents which would make the trip back dangerous.

"QSL information should be sent to: Beata Operation, PO Box 2191, Santo Domingo, Dominican Republic, West Indies (or via bureau: PO Box 1157, Santo Domingo, Dominican Republic). The cards are already being printed and we hope to start mailing them soon. We would like to remind all those who contacted us on the 27th to send an SAE and 3 IRCs in order to receive the first day cover.

"The prefix HI1 was activated for the first time, and now we are compiling all the information to be sent to the ARRL in order to try to qualify Beata as a new country. If this goal is achieved, the group would be willing to repeat the operation next year for a week.

"Thank you for your cooperation, and we hope you appreciate our effort."

## DX NOTEBOOK

### Bangladesh S2

S2BTF shows regularly on Saturdays near 14275 MHz after 1700Z.

### Qatar A7

A7XAH has been showing around 14225 kHz between 1300Z and 1500Z on Fridays. This is a list operation.

### Senegal 6W8

6W8HL has N1ACW as MC on 14260 kHz from 2100Z daily. At 2245Z they shift to 21275 kHz.

### South Georgia VP8

VP8SU has G3KTJ and QSL manager G3RCA running the list Sundays from 1900Z to 2100Z on 14280 kHz. He also hangs around this area during the week.

### Minami Torishima KA1

KA1NC regularly offers this rare one to 5BDXCC hunters at 1100Z on 3798 kHz.

### Christmas Island VK9XI

This is a club station and usually is activated on meeting nights. Look for it Wednesdays around 14225 kHz after 1530Z.

### Aves Island YV0AA

If you receive this magazine early, you may still be able to catch this one. The operation opens April 28th and will secure on May 1st at around 0600Z. The frequencies to watch are: 3795, 7085, 14195, 21245, 21295, and 28495 on SSB, and 25 kHz up from the bottom edge on CW. They will announce listening frequencies.

### Peter Island

Willy got to Peter Island just about on schedule, but after an on-site survey, any landing attempt had to be scrubbed. Willy decided to head east through the Drake Passage and into the Atlantic. He should have passed through ZD9 in April, and present plans call for stops at PY0/Trinidad in May, possibly PY0/St. Peter-St. Paul in June, and then on to the Azores by the end of July.

*Dick KV4AA and his SSB operating position, where many of the more than 48,000 QSOs in 1978 were made.*

## 48,100 QSOs IN 1978

With a last-minute spurt on December 30th and 31st which netted 540 QSOs, Dick Spenceley KV4AA wound up 1978 with a total of 48,100 contacts. This was an average of 131 per day, or one QSO every 11 minutes of 1978.

About 65 percent of the contacts were on CW, with the balance on SSB. A total of 199 countries were worked, with only a couple of them being "chased." Assorted equipment held up nicely, as did Dick's 73-year-old health.

Continuous calling by European stations on CW (even during QSOs) and the cooperation of U.S.A. SSB ops, plus contest operations, made large totals easy. KV4AA took part in just about every contest that turned up. Otherwise, QSOs, though short, were not of the "contest" or "DXpedition" variety. This makes a difference of three QSOs per minute versus one every three minutes.

All this started in 1976, when Dick's AJ3AA bicentennial call resulted in 35,335 QSOs, or an average of 96 per day. A goal of 36,500 contacts was set for 1978—100 per day. When this was passed on October 19th, a new goal of 45,000 was set. This was met on December 14th, and another 3,100 were worked.

It is realized that certain factors are a "must" for such totals, such as a fairly "exotic" call and plenty of time. This will limit most. KV4AA was not on continuously, as he works daily until 1:00 pm. Until the latter part of the year, he was seldom on after 7:00 pm. Stations contacted twice or more often during the same day were only counted one time, unless the mode and band were different.

Invaluable aid was given the project by YASME (WA6AHF) and other West Coast hams who handled the KV4AA QSLing chores.

KV4AA's three-year total now stands at 115,280 contacts. Dick says, "This year, we rest—but 't ain't easy getting used to."

## THE RUSSIAN WOODPECKER

The following report is from the *West Coast DX Bulletin* and was compiled by a W3.

"If you have not heard this one, you have not been on the air in the last year or two. Like a lot of other things, you try to live with it and wish it would go away—but it seldom does. Maybe if you know a bit more about it, it might help to tolerate the burden.

"The 'woodpecker' is a long-range radar; the range can be estimated by noticing that the repetition corresponds to 25-wpm CW dots. At this speed, the time from dot to dot is 96 milliseconds. This means that the radar range is roughly 47 million feet, or 8950 miles. This on-the-air estimate was done without instruments, so it is probably a bit in error. If the actual design range was 15,000 km, or 9320 miles, the error would be only 4%.

"Presuming a ten-million-Watt source, and 18 dBi of antenna gain, the effective radiated power, erp, is 88 dBW. However, if you figure twenty meters at 1000 miles, this immense signal is reduced by path loss to a mere .0006 of a Watt.

"This might make some think that a one-Watt jammer would have an advantage over the woodpecker of 1000:1, but this is not correct. Not all of a jamming signal will be effective unless it is able to pass through the i-f and video filters of the radar. A constant carrier is not effective at all, because it is rejected as a dc signal by the ac-coupled video circuitry of the radar.

"However, CW dots will get through. Assuming a rise time of one millisecond for amateur CW, an additional 20-dB advantage is given back to the radar because of the mismatch in rise time, video bandwidth, and corner frequency. Notice that the CW dot jammer, even if only using one Watt, still has a 10:1 advantage. A 100-Watt or a 1000-Watt signal would be even better.

"There is some reason to believe that much of the above is true. For one thing, the woodpecker is only heard on the phone bands, where voice envelopes can be rejected by the radar video circuitry. Also, if someone is sending CW dots at 25 wpm, the woodpecker usually shifts frequency within five minutes.

"Some have noted that continuous 25-wpm CW dots on the woodpecker's frequency have caused them to stop transmitting—one time, for a period of three weeks. The woodpecker then returned with a new gimmick. When problems developed, the woodpecker would switch to another frequency on the amateur band."

This seems very interesting, and while we sure aren't advocating intentional jamming, it would be interesting to experiment around with. The problem is, we aren't sure which would be worse, the woodpecker or a bunch of endless CW dots at 25 wpm.

### DX RIDDLE

Which three DXCC countries all share the same prefix, including numerical designator, yet are located within separate continental boundaries?

### QSL INFORMATION

3X1IX to Box 477, Conakry
4X4CW to WB0YHG
5R8EA to OZ6MI
6O1FG to I0DUD
6W8HL to Box 5012, Dakar
8Q7AF/AG to WB4ZNH
9J2BO to W6ORD
9M8HG to Box 2242, Kuching, Sarawak, Borneo
9N1MM to W3KVQ/N7EB
A7XAH to DJ9ZB
FM7WO to JH3XCU
FR7ZL/T to N4NX
IY7EX to I7DPO
JD1YA to JH1RNZ
K1CO/PJ7 to K3RYA
KA1IW to K8DYZ
KA1NC to K4JEX
KH3AA to Box 69, APO SF 96305
KP4AM/D to Box 717, Oakland CA
LU3ZY to LU2CN
S2BTF to I0JN
ST0HF to G4GFI
T2T to W5SBO
TF3CW to K1RH
VO6ONT to VO1HP
VP2DXA/B/C/D to W8UVZ
VP2LGK/LGL-J6LGL/LGK to WB4SXX
VP2MBH to W0SH
VP5HX to WA1SQB
VP8SU to G3RCA
VQ9MR to N5GU
VR1BD to W5RBO
VR3AK to Box 30323, Honolulu HI 96820
VR6TC to W6HS
VS5CW to Box 398, BSB, Brunei
WA7JRL/SU to W8LZV
WH4AAA to W5RU
YV0AA to Box 2285, Caracas DF
ZD9GH to ZS1Z

Many thanks to the *West Coast Dx Bulletin*, Long Island DX Association *Bulletin*, and *WorldRadio Magazine*.

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## New Products

*from page 26*

but also allows the internal speaker to remain unmuted.

The Communicator II has incorporated a novel mounting bracket which allows forward and backward slide adjustment to accommodate virtually any mobile mounting position. The transceiver mount mates with the mounting bracket slides and the unit is secured in place with two quick-turn knobs. Also included with the Communicator II is a desk-top bracket which snaps in place to elevate the front of the unit for indoor use.

A 24-pin accessory connector is mounted on the rear of the transceiver. Five connections are factory wired: PTT, ground, af input, af output, and 13.8 V. These will allow easy installation of TT, phone patch, or subaudible tones. The nineteen unconnected pins allow individualistic modification without case damage.

The Communicator II, priced at $399.00, carries a dealer-backed, factory warranty of one full year. *Pathcom, Inc., Amateur Radio Products Group, 24105 South Frampton Ave., Harbor City CA 90710.*

**A. G. Vaughan K5FQY**
**Los Alamos NM**

### A GREAT NEW HAND-HELD FROM HEATH

The amateur market is crowded with two meter rigs, yet I had been having problems finding one that would fit the budget of a high-school student. Then one day a new Heathkit catalog appeared in my mailbox. Glancing through the catalog, I found just what I had been seeking: Heath had come out with a new hand-held called the VF-2031. I was not only impressed with it, but also I could afford it.

Before I was to purchase it, however, there were two problems that had to be resolved. First of all, I had heard complaints from owners of Heath's previous hand-held, the HW-2021, which was recently discontinued. It seems that the 2021 had many design problems. Was the VF-2031 going to have gremlins also? After some reflection, I rationalized that Heath most likely had received much feedback on the previous rig's problems, and planned to eliminate similar problems from the VF-2031. The second thing that had me concerned was a notice in the catalog at the bottom of the rig's description. This little blurb stated that the kit was not recommended for beginning kit-builders. Although I had previously built several Heathkits, I was certainly not in the running for the "Kit-Builder's Hall of Fame." I finally decided that if I was to become experienced in electronics, this would be a good test of my ability. Besides, in the back of mind, I *knew* that I could do it. Subsequently, I decided to buy the kit.

Two weeks after ordering, my kit arrived. After opening the carton, the first thing that had to be done was to make several changes in the assembly manual as directed by a correction sheet. After this was completed, I glanced through the manual to become familiar with the construction of my hand-held. Heathkit manuals are a pleasure to read; every step is laid out in a clear, precise manner. There is even a separate book of diagrams so that one need not constantly flip between pages in the manual. Heath also provides various goodies to aid in kit construction: solder, desoldering braid, nut drivers, and alignment tools. The only tool that I did not have for construction of the kit was a pair of wire strippers. Although they are not necessary, past experience told me that these devices are very useful; I also feared that if I continued to strip wires with my teeth, I would become a Leon Spinks look-alike. A quick trip to the house of a friend (Mike WB7ECW) netted me a pair of wire strippers.

**Construction**

After putting aside the drop-in charger that was built in almost no time at all, I was ready to start the construction of the hand-held. Glancing at the printed circuit board, I realized that I would have to be careful while installing parts; the board is very crowded and things could become a bit rough if I had to remove a component that was tightly surrounded by others.

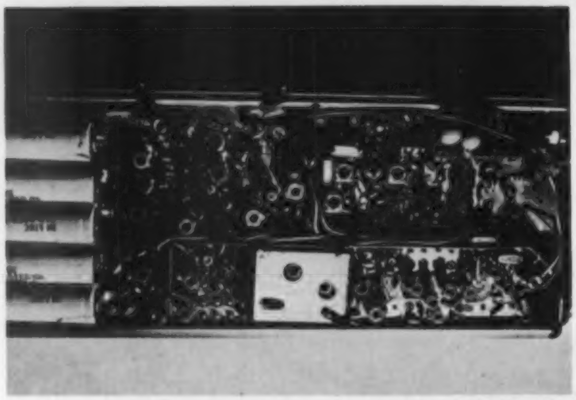
Since the board was compact, most components were mounted vertically. There was no room for Heath to put component values or numbers on the board, but what they did do, however, was put different symbols on the board for the components. A darkened-in circle, for example, was the symbol for a resistor. In this way, one could tell the relative positions of the components on the board.

Be careful of component placement with this method, as it can easily lead to confusion. At the time, however, I felt that I couldn't possibly install a component incorrectly. It was because of this attitude that a replacement choke had to be ordered. I was trying to remove a choke that was installed in the wrong spot (it seemed as good a spot as any after several hours of work) and, much to my dismay, I removed a lead from the choke at the same time. This wasn't enough for me, however, as I ended up breaking the glass body of a diode while making room for a capacitor that was to be installed. Moral of the story: Take frequent breaks and do not rush through the construction of any electronic kit.

Another thing that I had to be careful about was component values. Poor lighting can raise havoc with one's eyes, so I made sure that there was enough light so as to not strain

**Photos by Scott Rumbaugh**

*The VF-2031 as it sits in its charger.*



*Circuit board close-up. Note that the PC board is double-sided.*

my eyes. It is very difficult to read the color code of a resistor if the only source of illumination in the room is a desk lamp in the corner of the workbench. Also, a 2.2 pF capacitor looked very much like one of the 22 pF capacitors, as the decimal point was very faint. A similar problem arises with the small glass-bodied diodes; the bands are hard to see. If in doubt, one should use the magnifying glass that Heath encloses.

The printed circuit board is divided into six sections. After one section is completed, it is then time to move on to the next section. Heath provides some hints that might eliminate much misery. They suggest that one should take breaks and inspect each section after completion. These warnings make the kit sound as if it is very difficult to build, however, which it is not. I found the PC board construction to be fairly simple; it wasn't nearly as hard as I had expected. The hardest part of the kit was wiring. I had to be careful that my soldering iron didn't burn any insulation from adjacent wires while I was soldering. This was especially true with the switch wiring, which was fairly tight and constituted the hardest part of construction.

### Alignment

After a week of hibernation in my workshop (i.e., bedroom), the construction of the hand-held was complete. At this point, I brought out my trusty ol' VOM to make the resistance measurements. Everything checked out fine; at least my rig wasn't going to go up in smoke when power was applied. I was now ready to proceed and align the rig.

Alignment procedures have always been the worst part of kit construction for me. It is always frustrating to adjust one coil and then have to go back and readjust another coil, repeating this process over and over. I was afraid that the six pages of alignment steps were going to take longer to complete than the actual construction of the rig. As it turned out, these steps were completed in a couple hours and were not very difficult.

The only piece of test equipment needed for alignment is a VOM, an instrument that almost every ham owns or at least has access to. Rf signal generators, deviation meters, frequency counters, and wattmeters are other instruments that are helpful, but they are not required for alignment.

Several test points on the circuit board simplify the alignment procedure. All I had to do was hook my voltmeter to these test points and use the alignment tool to adjust the circuit coils for a peak or dip reading on the meter. The only rough spot in alignment that I encountered was with the receiver front end. The voltmeter readings hardly varied at all as I tried to peak the coils. If I had had an rf generator, things would have been a lot easier. I then remembered that I had a portable VHF receiver. I tuned this receiver 10.7 MHz below the hand-held's receive frequency. The VHF receiver's circuits put out a hefty signal that could be picked up on my hand-held. Voila! I now have an rf signal generator.

I then adjusted the transmitter section, getting a little more than two Watts output power. The deviation potentiometer was set to midrange because I didn't have a deviation meter. Later, I fine-tuned this control while on the air.

The final alignment step was to get the hand-held exactly on frequency. I borrowed a frequency counter from my electronics teacher, since the alignment without a counter involved more work than with one. In other words, I'm lazy! I quickly adjusted the trimmer inductors for each installed crystal. Now that the construction of my hand-held was complete, I was on the air.

### Operation

As soon as I put the transceiver on the air, I began to get excellent signal reports. The audio was good and I was getting into the repeater fine. Needless to say, it was good for my ego to have the rig work well. A day or two later, however, I ran into a problem. WB7NML had given me a call on the local repeater; when I answered, he didn't respond. I called him again, but he again did not reply. He then cleared and I noticed that the receiver was "motorboating." I then realized the problem: Nicads don't stay charged forever. The nicads in the VF-2031 last about ten hours on a charge, and on the previous night I had forgotten to place the transceiver in its charger.

### Conclusion

The VF-2031 has many features that have made it worth more than the $190 that Heath asks for it, including:

- eight channel capability
- 146.94 MHz crystal
- only one crystal per channel is used; one crystal renders one receive and three (−600 kHz, simplex, +600 kHz) transmit frequencies
- separate microphone and speaker built in
- BNC antenna jack
- battery-saving squelch circuit
- earphone
- many available accessories (external microphone, continuous tone encoder, autopatch encoder, amplifier, and holster-type carrying case)

As demonstrated by the above features and the quality of the rig, it is obvious Heath has come out with a winner—the VF-2031.

**Mark Rumbaugh WB7NMM**
**Corvallis OR**

## THE MIDLAND 13-510—A USER REVIEW

For quite some time, I have been wanting and trying to get active on two meter FM. It wasn't until just recently that I found myself in a position to make the big jump and purchase that two meter rig. Wanting to get the most rig for the amount of money spent, I did a lot of studying in past issues of *73 Magazine* to see if anyone had ever reviewed the various pieces of two meter mobile rigs and, if so, what they had to say about them. At first, as many articles were published on adding channels to the Icom IC-22S, I thought that this would be an easy rig to work with. Then the many various ham outlet stores started to have their year-end sales. The prices looked better with each issue of *73*. Finally, I made the big jump and called one of the leading stores. They were all out of the IC-22S, as well as most of the crystal-controlled rigs. I also noticed in their advertisement that the Midland synthesized model 13-510 was being listed at $100.00 below suggested retail. Luck of the poor be with me, they had one. So I made the choice, and I believe that I made a very wise choice. I anxiously awaited the UPS truck; after five days, I received the Midland. As I opened the box and pulled out the transceiver, I noticed how everything was carefully packed. I started reading the instruction book and found it to be very straightforward. In no time whatever, I had the rig installed and operating.

A check of the local repeater frequency showed no activity, so I switched down to the Louisville repeater frequency. The Louisville repeater is about forty miles or more from my home, but there was activity on the channel. I waited and listened for a clear period of time to make a try at keying the repeater. I pushed the mike button and gave my call to see if anything would happen. What a thrill to have a Louisville station come back to me and ask for my location. Since then, I have met many new hams on both the local and the Louisville repeaters. Believe me, this is the mode to use, as there is no noise, lots of consideration and assistance to the newcomer on the band, and many good interference-free QSOs.

After getting used to the Midland, I decided to see what all was in the book and learn a little more about the rig. What a treasure-trove of information I found. Let's see what we have.

First off, the Midland is an all-synthesized unit covering the range of 146.00 to 147.995 MHz. It has a one-Watt low-power position and a 25-Watt high-power position. The modulation is direct F-3 and requires a 600-Ohm microphone, which is furnished. The primary power requirement is 13.8 volts positive dc plus or minus 15%. Duplex shift for plus 600 and minus 600 kHz is furnished. Two provisions are provided for other offset frequencies.

In the receiver, the following information is furnished. It is a double superhet, with a first i-f of 16.9 MHz and a second i-f of 455 kHz. The sensitivity is claimed to be .5 microvolts with 20 dB of quieting at a signal-to-noise ratio of .3 microvolts at 12 dB or more. The audio output is 1.5 Watts into an eight-Ohm load. Frequency control is the popular PLL covering the range of 127.1 to 131.1 MHz with no doubling in the PLL. There are 39 transistors, 10 FETs, 14 integrated circuits, and 28 diodes in the set. The following accessories are included: mobile mount, dynamic microphone, mike hanger, a spare 7-Amp fuse, external speaker plug, and an accessory plug for the accessory socket on the rear panel. The mount is a snap-in unit, which makes it very easy to remove the rig if you don't want to leave it in the car. The power cable has a three-pin socket that makes for easy removal and is so arranged that only the proper polarity can be obtained when plugging the rig in.

The really amazing thing about the entire unit is the amount of information that is furnished in the operator's manual. Midland really had the do-it-yourself amateur in mind when they printed the manual. The manual includes, in addition to basic hookup and operating instructions, the following: block diagram, schematic diagram, wiring diagram, voltage chart, frequency table with a frequency breakdown diagram, top and bottom chassis photos, detailed printed circuit board diagrams, FET, transistor, and IC terminal guide, coax cable plug assembly diagram, and, the most valuable of all, complete alignment instructions. As you can see, it is one of the most complete manuals that I have seen on amateur equipment in some time.

I do not have the facilities to run any real technical signal-to-noise tests or to check the manufacturer's specifications for what is claimed, but I can tell you that all of the on-the-air checks have been very satisfying. The audio is very clear and plenty adequate for normal use. Very little squelch control rotation is needed to have full quieting. All in all, I would rate the Midland 13-510 as one of the best units on the market for under three hundred dollars. I hope you enjoy your rig as much as I do mine, and maybe someday I will hear you on one of the repeaters across the country. See you on two FM.

*Midland International, PO Box 1903, Kansas City MO 64141.* Reader service number M41.

**Billy L. Nielsen WB4APC**
**Radcliff KY**

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# Social Events

*from page 123*

32233. Price at the door will be $3.50.

A large indoor swap area will be featured, with advance table reservations available for $5.00 per table per day from Robbie Roberts KH6FMD/W4, 10557 Atlantic Blvd., #31, Jacksonville, Florida 32211. Information on exhibitors' booths and space are available from the same address.

Other features and programs include statewide organization meetings on such topics as traffic nets and MARS, a microprocessor seminar, a solar power demonstration, a DX "pileup" contest, a hidden transmitter hunt, an OSCAR forum, ARRL forums, emergency preparedness programs, DX and contest presentations, antenna and technical seminars, and much more.

More general information may be obtained from JHA, 911 Rio St. Johns Dr., Jacksonville FL 32211.

### LITTLE ROCK AR
### AUG 4-5

The Central Arkansas Radio Emergency Net (CAREN) Amateur Radio Club will hold its second annual Ham-a-Rama on Saturday and Sunday, August 4-5, 1979, at the Arkansas State Fairgrounds, Little Rock, Arkansas. There will be two main prizes given, as well as door prizes. Featured will be forums, dealers' exhibits, a Saturday night party, and a large flea market. Talk-in on 146.34/.94. For details, send an SASE to Morris Middleton AD5M, 19 Elmherst Drive, Little Rock AR 72209.

### ANGOLA IN
### AUG 5

The Steuben County Radio Amateurs will hold their annual F.M. Picnic and Hamfest on Sunday, August 5, 1979, at Crooked Lake, Angola, Indiana. There will be prizes, picnic-style barbecued chicken, inside tables for exhibitors and vendors, and overnight camping (fee charged by county park). Talk-in on 146.52 and 147.81/.21. Admission is $2.00.

### CEDARTOWN GA
### AUG 12

The Cedar Valley Amateur Radio Club will hold its annual Cedar Valley Hamfest on August 12, 1979, from 8:00 am to 4:00 pm at the Polk County Fairgrounds, on US 278, two miles east of Cedartown, Georgia. There will be food, drinks, and prizes. Talk-in on 147.72/.12 (WR4AZU). For more information, please contact Jim T. Schliestett W4IMQ, Secretary, Cedar Valley ARC, PO Box 93, Cedartown GA 30125, or phone (404)-748-5968.

### LEXINGTON KY
### AUG 12

The Bluegrass Amateur Radio Club will hold its annual Central Kentucky Hamfest on August 12, 1979, at the Fasig-Tipton Sales Paddock, Newton Pike, Lexington, Kentucky. The program will include grand prizes, hourly door prizes, manufacturers' exhibits, an indoor/outdoor flea market, guest speakers, and forums. For information, contact the Bluegrass Amateur Radio Club, Inc., PO Box 4411, Lexington KY 40504.

### PETOSKEY MI
### AUG 18-19

The Straits Area Radio Club will hold its Swap 'n Shop and hamfest on August 18-19, 1979, at Petoskey Middle School, State and Howard Streets, across from the Catholic church and post office, Petoskey, Michigan. There will be a donation of $2.00 at the door. Table space is also $2.00. Refreshments will be available. There will be a swap and shop on Saturday from 9:00 am to 4:00 pm and on Sunday from 9:00 am to 12:00 pm. Prizes, a ladies' program, and seminars at 11:00 am and 2:00 pm on Saturday will be featured. A banquet at the Holiday Inn on Saturday at 7:00 pm will have Mellish Reef DXpeditioner Bob Walsh WA8MOA as guest speaker. Banquet tickets are $7.50 and are limited to 200, sold in advance only. For full information and lodging, send an SASE to Bill Moss WA8AXF, 715 Harvey Street, Petoskey MI 49770, or phone (616)-347-4734.

### ROSEMONT IL
### SEP 7-9

The Quarter Century Wireless Association will hold its 1979 Chicago Convention on September 7-9, 1979, at the O'Hare/Kennedy Holiday Inn, Rosemont, Illinois. The complete package for the three days is $35.00. Special room rates will also be available. There will be the annual banquet, special ladies' program, various tours, and prizes. For reservations and information, write Phil Haller W9HPG, 6000 S. Tripp, Chicago IL 60629.

### PECATONICA IL
### SEP 9

The Rockford Amateur Radio Association will hold its second annual Rockford Hamfest and Illinois State ARRL Convention on Sunday, September 9, 1979, at the exhibition hall at the Winnebago County Fairgrounds at Pecatonica, Illinois, just west of Rockford on US Rte. 20. Tickets are $2.00 in advance or $2.50 at the gate. Tickets are available by mail by writing RARA, PO Box 1744, Rockford, Illinois 61110. Please include an SASE for tickets by mail. Prizes include a Kenwood TS-520S transceiver and an Atlas receiver. Campsites are available on site, with electric and sanitary hookup available. There are 300 flea-market tables available at a nominal charge. Plenty of free parking is available. Featured will be speakers, forums, demonstrations, and discussions. A hamfest menu, including hot dogs, BBQ, and soft drinks will be available at reasonable prices. Talk-in on 146.01/.61 or 146.52.

# Corrections

I received some comments on my article, "Build a Hybrid Capacity Meter" (March, 1979, page 40), and would like to respond.

Through my error, I did not catch the missing value of the bypass capacitor on pin 5 of the 555 (IC1). This component is optional, but if it is desired, a value of .01 to .1 uF will do.

I also received a letter concerning inaccuracy on ranges other than the one which is calibrated. I double-checked mine and the accuracy is more than adequate. For those requiring the ultimate in accuracy, the following may be performed: Select a 1%, or smaller, tolerance capacitor that will be a midrange value for the selected range (e.g., ≈50 pF for the 1-to-100-pF range) and adjust the calibration control for exactly 50 pF. The scale will then be as accurate as your capacitor, less any nonlinearity of the meter. Naturally, the range switch should be on the desired range.

I also received a call concerning an inability to get a full-scale reading when testing a capacitor that would normally read at, or near, full scale. This can be caused by several things: leaky rectifier diodes, leaky filter capacitor, meter resistance is too high, or the clock frequency is too low. The clock should be operating between 200 and 300 kHz.

**Glen A. Delbert WA4HUU**
**Fayetteville NC**

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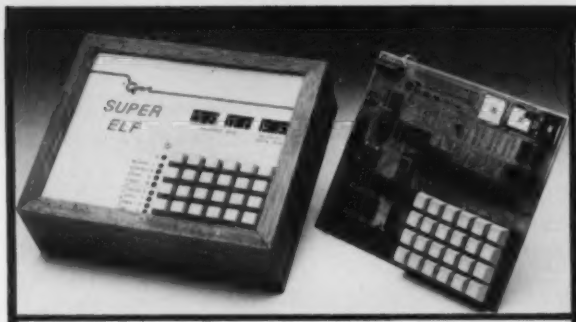

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**Cassette $10.00. On ROM $38.00.** Super Elf owners, 30% off. **Object code listing with manual $5.00. Object list, manual and paper tape $10.00. Original ELF Kit Board $14.95.**

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This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes.

**A 1K Super ROM Monitor $19.95** is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatible cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. The Super Monitor is written with subroutines allowing users to take advantage of monitor functions simply by calling them up. Improvements and revisions are easily done with the monitor. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports with full handshake.** They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. A Godbout 8K RAM board is available for $135.00. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50. A 50 pin connector set** with ribbon cable is available at $12.50 for easy connection between the **Super Elf** and the **Super Expansion Board.**

The **Power Supply Kit** for the Super Expansion Board is a 5 amp supply with multiple positive and negative voltages $29.95. Add $4.00 for shipping. Prepunched frame $5.00. Case $10.00. Add $1.50 for shipping.

P.O. Box 4430M Santa Clara, CA 95054
For will call only: (408) 988-1640
2322 Walsh Ave.

**Quest ELECTRONICS** Q3

**Same day shipment.** First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

## INTEGRATED CIRCUITS

| 7400TTL | |
|---|---|
| 7400N | .17 |
| 7402N | .17 |
| 7404N | .10 |
| 7409N | .23 |
| 7410N | .17 |
| 7414N | .63 |
| 7420N | .17 |
| 7422N | 1.39 |
| 7430N | .20 |
| 7442N | .50 |
| 7443N | .69 |
| 7447N | .69 |
| 7448N | .69 |
| 7450N | .17 |
| 7474N | .29 |
| 7475N | .49 |
| 7485N | .88 |
| 7489N | 2.00 |
| 7490N | .43 |
| 7492N | .43 |
| 7493N | .43 |
| 7495N | .69 |
| 74100N | .90 |
| 74107N | .29 |
| 74121N | .34 |
| 74123N | .59 |
| 74125N | .39 |
| 74145N | .69 |
| 74150N | .95 |
| 74151N | .69 |
| 74154N | 1.00 |
| 74157N | .69 |
| 74161N | .87 |
| 74162N | .87 |
| 74163N | .87 |
| 74174N | .96 |
| 74175N | .90 |
| 74190N | 1.15 |
| 74192N | .87 |
| 74193N | .89 |
| 74221N | 1.55 |
| 74298N | 1.60 |
| 74365N | .69 |
| 74366N | .69 |
| 74367N | .69 |

| 74LS00 TTL | |
|---|---|
| 74LS00N | .25 |
| 74LS02N | .25 |
| 74LS04N | .25 |
| 74LS05N | .25 |
| 74LS08N | .25 |
| 74LS10N | .25 |
| 74LS13N | .45 |
| 74LS14N | .90 |
| 74LS20N | .25 |
| 74LS22N | .25 |
| 74LS28N | .41 |
| 74LS30N | .25 |
| 74LS33N | .39 |
| 74LS38N | .39 |
| 74LS74N | .39 |
| 74LS75N | .47 |
| 74LS90N | .51 |
| 74LS93N | .51 |
| 74LS95N | 1.00 |
| 74LS107N | .35 |
| 74LS112N | .35 |
| 74LS113N | .35 |
| 74LS132N | .72 |
| 74LS136N | .35 |
| 74LS151N | .67 |
| 74LS155N | .67 |
| 74LS157N | .67 |
| 74LS162N | .91 |
| 74LS163N | .91 |
| 74LS174N | .99 |
| 74LS190N | 1.00 |
| 74LS221N | 1.95 |
| 74LS259N | .97 |
| 74LS367N | 1.35 |

| LINEAR | |
|---|---|
| CA3045 | .90 |
| CA3046 | .87 |
| CA3081 | 1.80 |
| CA3082 | 1.90 |
| CA3089 | 2.95 |
| LM301AN/AH | .35 |
| LM305H | .87 |
| LM307N | .35 |
| LM308N | .89 |
| LM309H | 1.15 |
| LM309K | 1.50 |
| LM311H/N | .90 |
| LM317T/K | 2.92 |
| LM318 | 1.35 |
| LM320K-5 | 1.35 |
| LM323K-5 | 6.95 |
| LM320K-12 | 1.35 |
| LM320K-15 | 1.35 |
| LM320T-5 | 1.60 |
| LM320T-8 | 1.60 |
| LM320T-12 | 1.60 |
| LM320T-15 | 1.60 |
| LM324N | 1.15 |
| LM339N | 1.95 |
| LM340K-5 | 1.35 |
| LM340K-8 | 1.35 |
| LM340K-12 | 1.35 |
| LM340K-15 | 1.35 |
| LM340K-24 | 1.35 |
| LM340T-5 | 1.25 |
| LM340T-8 | 1.25 |
| LM340T-12 | 1.25 |
| LM340T-15 | 1.25 |
| LM340T-18 | 1.25 |
| LM340T-24 | 1.25 |
| LM343H | 4.50 |
| LM350 | 7.50 |
| LM370 | 1.15 |
| LM377 | 3.00 |
| LM379 | 5.00 |
| LM380N | 1.00 |
| LM381 | 1.60 |
| LM382 | 1.60 |
| LM703H | .40 |
| LM709H | .28 |
| LM723H/N | .50 |
| LM733N | .67 |
| LM741CH | .35 |
| LM741N | .25 |
| LM747H/N | .82 |
| LM748N | .35 |
| LM1303N | .82 |
| LM1304 | 1.10 |
| LM1305 | 1.27 |
| LM1307 | 2.00 |
| LM1310 | 2.75 |
| LM1458 | .47 |
| LM1800 | 1.75 |
| LM1812 | 7.50 |
| LM1889 | 3.00 |
| LM2111 | 1.75 |
| LM2902 | 1.50 |
| LM3900N | .60 |
| LM3905 | 1.75 |
| LM3909N | .61 |
| MC1458V | .50 |
| NE540L | 2.00 |
| NE550N | .65 |
| NE555V | .43 |
| NE556A | .79 |
| NE565A | 1.00 |
| NE566V | 1.50 |
| NE567V | 1.30 |
| NE570B | 5.00 |
| NE571B | 5.00 |
| 78L05 | .60 |
| 78L08 | .60 |
| 78L05 | .70 |
| 78M05 | .85 |
| 75108 | 1.75 |
| 75491CN | .50 |
| 75492CN | .50 |
| 75494CN | .89 |

| A to D CONVERTER | |
|---|---|
| 8038B | 4.50 |
| 8700CJ | 13.95 |
| 8701CN | 22.00 |
| 8750CJ | 13.95 |
| LD130 | 9.95 |
| 9400CJV/F | 7.40 |
| ICL7103 | 9.50 |
| ICL7107 | 14.25 |

| CMOS | |
|---|---|
| CD34001 Fair | .50 |
| CD4000 | .16 |
| CD4001 | .21 |
| CD4002 | .21 |
| CD4006 | 1.10 |
| CD4007 | .21 |
| CD4008 | .21 |
| CD4009 | .39 |
| CD4010 | .39 |
| CD4011 | .21 |
| CD4012 | .21 |
| CD4013 | .36 |
| CD4014 | .80 |
| CD4015 | .96 |
| CD4016 | .36 |
| CD4017 | .94 |
| CD4018 | .94 |
| CD4019 | .21 |
| CD4020 | 1.02 |
| CD4021 | 1.02 |
| CD4022 | .80 |
| CD4023 | .21 |
| CD4024 | .75 |
| CD4025 | .21 |
| CD4026 | 1.51 |
| CD4027 | .36 |
| CD4028 | .79 |
| CD4029 | 1.02 |
| CD4030 | .21 |
| CD4035 | 1.00 |
| CD4040 | 1.02 |
| CD4042 | .71 |
| CD4043 | .60 |
| CD4044 | .63 |
| CD4046 | 1.67 |
| CD4049 | .36 |
| CD4050 | .36 |
| CD4051 | 1.13 |
| CD4053 | 1.42 |
| CD4066 | .71 |
| CD4068 | .40 |
| CD4069 | .40 |
| CD4070 | .40 |
| CD4071 | .21 |
| CD4072 | .21 |
| CD4073 | .21 |
| CD4075 | .21 |
| CD4076 | 1.75 |
| CD4078 | .40 |
| CD4081 | .21 |
| CD4082 | .21 |
| CD4116 | .47 |
| CD4490 | 5.50 |
| CD4507 | 1.00 |
| CD4508 | 4.25 |
| CD4510 | 1.02 |
| CD4511 | .94 |
| CD4515 | 2.52 |
| CD4516 | 1.10 |
| CD4518 | 1.02 |
| CD4520 | 1.02 |
| CD4527 | 1.51 |
| CD4528 | .79 |
| CD4563 | 3.50 |
| CD4566 | 2.25 |
| CD4583 | 4.50 |
| CD4503 | 1.10 |
| CD40192 | 3.00 |
| 74C00 | .28 |
| 74C04 | .35 |
| 74C10 | .28 |
| 74C14 | 2.10 |
| 74C20 | .28 |
| 74C30 | .28 |
| 74C48 | 1.90 |
| 74C74 | .75 |
| 74C76 | 1.40 |
| 74C90 | 1.15 |
| 74C93 | 1.40 |
| 74C154 | 3.00 |
| 74C160 | 1.44 |
| 74C175 | 1.35 |
| 74C192 | 1.65 |
| 74C221 | 2.00 |
| 74C905 | 3.00 |
| 74C906 | .75 |
| 74C914 | 1.95 |
| 74C922 | 5.00 |
| 74C923 | 5.50 |
| 74C925 | 6.95 |
| 74C926 | 6.95 |
| 74C927 | 9.95 |

| INTERFACE | |
|---|---|
| 8095 | .65 |
| 8096 | .65 |
| 8097 | .65 |
| 8098 | .65 |
| 8T09 | 1.35 |
| 8T10 | 4.00 |
| 8T13 | 3.00 |
| 8T20 | 5.50 |
| 8T23 | 3.10 |
| 8T24 | 3.00 |
| 8T25 | 3.20 |
| 8T26 | 1.69 |
| 8T28 | 2.75 |
| 8T97 | 1.69 |
| 8T98 | 1.69 |

| MOS/MEMORY RAM | |
|---|---|
| 2101-1 | 3.95 |
| 2102-1 | .95 |
| 2102AL-4 | 1.00 |
| 21L02-1 | 1.10 |
| 21F02 | 1.25 |
| 2104A-4 | 4.95 |
| 2107B | 4.95 |
| 2111-1 | 3.75 |
| 2112-2 | 3.95 |
| 2114L-3 | 7.95 |
| 4116 | 10.95 |
| 2513B | 6.50 |
| MM5262 | .40 |
| MM5280 | 3.00 |
| MM5320 | 9.95 |
| MM5330 | 5.94 |
| PD411D-3 | 4.00 |
| PD411D-4 | 5.00 |
| P5101L | 13.95 |
| 4200A | 9.95 |
| 82S25 | 2.90 |
| 91L02A | 1.50 |
| HD0165-5 | 6.95 |
| MM57100 | 4.50 |
| GIAY38500-1 | 9.95 |
| MCM6571A | 9.95 |
| 9368 | 3.50 |
| 4100 | 10.00 |
| 416 | 16.00 |

| CLOCKS | |
|---|---|
| MM5309 | 3.00 |
| MM5311 | 3.00 |
| MM5312 | 4.00 |
| MM5313 | 3.00 |
| MM5314 | 3.90 |
| MM5315 | 4.00 |
| MM5316 | 5.00 |
| MM5318 | 9.00 |
| MM5369 | 2.10 |
| MM5841 | 14.45 |
| MM5865 | 7.95 |
| CT7001 | 5.80 |
| CT7002 | 8.95 |
| CT7010 | 8.95 |
| CT7015 | 7.25 |
| MM5375AA/N | 3.90 |
| MM5375AB/N | 4.90 |
| 7205 | 16.50 |
| 7207 | 7.50 |
| 7208 | 15.95 |
| 7209 | 4.95 |
| DS0026CN | 3.75 |
| DS0056CN | 3.75 |
| MM53104 | 2.50 |

| MICROPROCESSOR | |
|---|---|
| 6800 | 17.50 |
| 6802 | 24.95 |
| 8080A with data | 8.95 |
| 8085 | 27.00 |
| Z80A | 19.75 |
| 8212 | 2.90 |
| 8214 | 8.90 |
| 8216 | 2.90 |
| 8224 | 2.90 |
| 8228 | 5.35 |
| 8251 | 8.50 |
| 8253 | 18.00 |
| 8255 | 9.25 |
| 8257 | 19.50 |
| 8259 | 19.50 |
| 1802CP plus | 13.95 |
| 1802DP plus | 17.95 |
| 1861P | 11.50 |
| CDP1802CD | 19.95 |
| CDP1802D | 25.50 |
| CDP1861 | 12.95 |
| 6820 | 9.95 |
| 6850 | 12.95 |
| 6860 | 12.50 |

**IC SOCKETS**

| Solder Tin | | Low Profile | |
|---|---|---|---|
| PIN | 1UP | PIN | 1UP |
| 8 | .15 | 22 | .30 |
| 14 | .18 | 24 | .35 |
| 16 | .20 | 28 | .42 |
| 18 | .27 | 36 | .58 |
| 20 | .29 | 40 | .57 |

3 level wire wrap gold
14 pin .35
2 level 14 pin ww .20

**WIRE WRAP LEVEL 3**

| PIN | | PIN | |
|---|---|---|---|
| 14 | .25 | 24 | .88 |
| 16 | .30 | 28 | 1.00 |
| 18 | .57 | 40 | 1.23 |

| UART/FIFO | |
|---|---|
| AY5-1013 | 5.50 |
| AY5-1014 | 7.50 |
| 3341 | 6.95 |

| PROM | |
|---|---|
| 1702A | 3.95 |
| MM5203 | 2.95 |
| 82S123 | 3.50 |
| 82S126 | 3.75 |
| 82S129 | 3.75 |
| 82S131 | 3.75 |
| 82S136 | 8.75 |
| 82S137 | 8.75 |
| 2708 | 10.50 |
| DM8577 | 2.90 |
| 8223 | 2.90 |
| 2716T1 | 29.50 |
| 2716 Intel | 40.00 |

| CRYSTALS | |
|---|---|
| 1 MHz | 4.50 |
| 2 MHz | 4.50 |
| 4 MHz | 4.25 |
| 5 MHz | 4.25 |
| 10 MHz | 4.25 |
| 18 MHz | 3.90 |
| 20 MHz | 3.90 |
| 32 MHz | 3.90 |
| 32768 MHz | 4.00 |
| 1.8432 MHz | 4.50 |
| 3.5795 MHz | 1.20 |
| 2.0100 MHz | 1.95 |
| 2.097152 MHz | 4.50 |
| 2.4576 MHz | 4.50 |
| 3.2768 MHz | 4.50 |
| 5.0688 MHz | 4.50 |
| 5.185 MHz | 4.50 |
| 5.7143 MHz | 4.50 |
| 6.5536 MHz | 4.50 |
| 14.31818 MHz | 4.25 |
| 18.432 MHz | 4.50 |
| 22.1184 MHz | 4.50 |

| CONNECTORS | |
|---|---|
| 44 pin edge | 2.75 |
| 100 pin edge | 4.50 |
| 100 pin edge WW | 5.25 |

| KEYBOARD ENCODERS | |
|---|---|
| AY5-2376 | $12.50 |
| AY5-3600 | 13.50 |
| 74C922 | 5.50 |
| 74C923 | 5.50 |
| HD0165-5 | 6.95 |

| IC Test Clips | 1 | 10 |
|---|---|---|
| Red | .50 | .47 |
| Black | .50 | .47 |

Keyer 8043 14.50
comp. w/spec./bank

| TRANSISTORS | |
|---|---|
| 2N1893 | .40 |
| 2N2222A | .15 |
| 2N2369 | .30 |
| 2N2904A | .25 |
| 2N2907A | .25 |
| 2N3053 | .40 |
| 2N3638 | .25 |
| 2N3643 | .25 |
| 2N3904 | .10 |
| 2N3906 | .10 |
| 2N3055 | .69 |
| 2N4400 | .25 |
| 2N4401 | .75 |
| 2N4402 | .20 |
| TIP31 | .80 |
| TIP33A | 1.00 |

**D Connectors RS232**
25 Pin Subminiature

| | |
|---|---|
| DB25P | 2.95 |
| DB25S | 3.95 |
| Cover | 1.50 |
| RS232 Complete Set | 6.50 |
| DE9P | 1.50 |
| DE9S | 1.95 |
| DA15P | 2.10 |
| DA15S | 3.10 |

**CLOCK MODULES** Complete alarm clocks ready to hook up with transformer and switches. Very compact with .50" and .84" digits.

| | |
|---|---|
| MA1002A, C or E .50" | 8.95 |
| 102P3 Transformer | 2.25 |
| MA1010A, C or E .84" | 11.95 |
| 102P2 Transformer | 2.25 |
| Special transformer and six switches when purchased w/module | 2.95 |
| MA1003 car module .3" green fluor. display | 16.95 |

**RESISTORS** ¼ watt 5%

| | | | |
|---|---|---|---|
| 10 per type | .03 | 1000 per type | .012 |
| 25 per type | .025 | 350 piece pack | |
| 100 per type | .015 | 5 per type | 6.75 |

| KEYBOARDS | |
|---|---|
| 56 key ASCII keyboard kit | $67.50 |
| Fully assembled | 77.50 |
| 53 key ASCII keyboard kit | 60.00 |
| Fully assembled 70.00 Enclosure | 14.95 |

| LEDS | |
|---|---|
| Red TO18 | .15 |
| Green, Yellow TO18 | .20 |
| Jumbo Red | .20 |
| Green, Orange, Yellow Jumbo | .25 |
| Clipite LED Mounting Clips | 8/$1.25 |

(specify red, amber, green, yellow, clear)

**CONTINENTAL SPECIALTIES in stock**
Complete line of breadboard test equip.
**MAX-100 8 digit Freq. Ctr. $128.95**

**OK WIRE WRAP TOOLS in stock**
**Portable Multimeter $18.00**

**DIGITAL THERMOMETER $49.95**
Batt. oper. General purpose or medical 32°–230°F. Disposable probe cover ± .2° accuracy. Comp. Assy. in compact case. Switches from F to C.

| COMPUTER BOARD KITS | |
|---|---|
| 8K RAM Board Kit | $135.00 |
| 4K EPROM Kit | 114.95 |
| I/O Board Kit | 41.50 |
| Extender Board w/connector | 12.50 |
| 16K EPROM board kit w/o PROMS | 74.50 |
| North Star Floppy Disk Kit | $665.00 |
| Additional Drive Kit | 415.00 |

| SPECIAL PRODUCTS | |
|---|---|
| MM5865 Stopwatch Timer | 9.00 |
| PC board | 7.50 |
| Switches Mom. Pushbutton | .27 |
| 3 pos. slide | .25 |
| Encoder HD0165-5 | 6.95 |
| 3 Digit Universal Counter Board Kit Operates 5–18 Volt DC to 5 MHz typ. .125" LED display | 10.50 |
| Voice activated switch | .60 |
| Paratronics 100A Logic Analyzer Kit | $224.00 |
| Model 10 Trigger Expander Kit | $229.00 |
| Model 150 Bus Grabber Kit | $369.00 |
| Sinclair 3½ Digit Multimeter | $59.95 |
| Clock Calendar Kit | $23.95 |

| TRANSFORMERS | |
|---|---|
| 6V 300 ma | 3.25 |
| 12 Volt 300 ma transformer | 1.25 |
| 12.6V CT 600 ma | 3.75 |
| 12V 250 ma wall plug | 2.95 |
| 12V CT 250 ma wall plug | 3.50 |
| 24V CT 400 ma | 3.95 |
| 10V 1.2 amp wall plug | 4.85 |
| 12V 6 amp | 12.95 |

| DISPLAY LEDS | | | |
|---|---|---|---|
| MAN1 | CA | .270 | 2.90 |
| MAN3 | CC | .125 | .39 |
| MAN72/74 | CA/CA | .300 | 1.00 |
| DL704 | CC | .300 | 1.25 |
| DL707/DL707R | CA | .300 | 1.00 |
| DL727/728 | CA/CC | .500 | 1.90 |
| DL747/750 | CA/CC | .600 | 1.95 |
| DL750 | CC | .600 | 1.95 |
| FND359 | CC | .357 | .70 |
| FND500/507 | CC/CA | .500 | 1.35 |
| FND503/510 | CC/CA | .500 | .90 |
| FND800/807 | CC/CA | .800 | 2.20 |
| 3 digit Bubble | | | .60 |
| 4 digit Bubble | | | .80 |
| DG8 Fluorescent | | | 1.75 |
| DG10 Fluorescent | | | 1.75 |
| 5 digit 14 pin display | | | 1.00 |
| NSN69 9 digit display | | | .60 |
| 7520 Clairex photocells | | | .39 |
| TIL311 Hex | | | 9.50 |

| COMPUTER GRADE CAPS | | | |
|---|---|---|---|
| 1800 | mfd | 200V | 4.50 |
| 2000 | mfd | 45V | 2.50 |
| 3200 | | 50V | 2.50 |
| 5500 | | 25V | 2.50 |
| 5800 | | 40V | 3.00 |
| 6100 | | 40V | 3.00 |
| 6100 | | 50V | 3.00 |
| 7700 | | 50V | 2.00 |
| 8000 | | 50V | 2.50 |
| 9400 | | 60V | 3.00 |
| 10000 | | 20V | 2.50 |
| 12000 | | 30V | 3.50 |
| 35000 | | 25V | 3.00 |
| 35000 | | 25V | 3.00 |
| [illegible] | | 15V | 6.00 |
| [illegible] | | 10V | 6.00 |

### Auto Clock Kit $15.95

DC clock with 4-.50" displays. Uses National MA-1012 module with alarm option. Includes light dimmer, crystal timebase PC boards. Fully regulated, comp. instructs. Add $3.95 for beautiful dark gray case. Best value anywhere.

### RCA Cosmac VIP Kit $229.00

Video computer with games and graphics. Fully assem. and test. **$249.00**

### Not a Cheap Clock Kit $14.95

Includes everything except case. 2-PC boards. 6-.50" LED Displays. 5314 clock chip, transformer, all components and full instructions. Orange displays also avail. **Same kit w/.80" displays.** Red only. **$21.95** Case $11.75

### 60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy. Kit includes: PC board, IC, crystal, resistors, capacitors and trimmer.

### Digital Temperature Meter Kit

Indoor and outdoor. Switches back and forth. Beautiful. .50" LED readouts. Nothing like it available. Needs no additional parts for complete, full operation. Will measure −100° to +200°F, tenths of a degree, air or liquid. Very accurate. **$39.95**
Beautiful woodgrain case w/bezel **$11.75**

### NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. **$7.25**

**PROM Eraser** Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled **$34.50**

### Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display, ROM monitor, fully expandable. $375.00. 4K version $450.00. 4K Assembler $85.00. 8K Basic Interpreter $100.00. Power supply assembled in case $60.00.

### Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12 option. ±5v, ±12v are regulated. Kit $29.95. Kit with punched frame $34.95. Woodgrain case $10.00.

### Video Modulator Kit $8.95

Convert your TV set into a high quality monitor without affecting normal usage. Complete kit with full instructions.

### 2.5 MHz Frequency Counter Kit

Complete kit less case **$37.50**

### 30 MHz Frequency Counter Kit

Complete kit less case **$47.75**
Prescaler kit to 350 MHz **$19.95**

### 79 IC Update Master Manual $35.00

Complete IC data selector, 2500 pg. master reference guide. Over 50,000 cross references. Free update service through 1979. Domestic postage $3.50. Foreign $5.00. 1978 IC Master closeout $19.50.

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Full six digit battery operated. 2–5 volts. 3.2768 MHz crystal accuracy. Times to 59 min., 59 sec., 99 1/100 sec. Times std., split and Taylor. 7205 chip, all components minus case. Full instructions.

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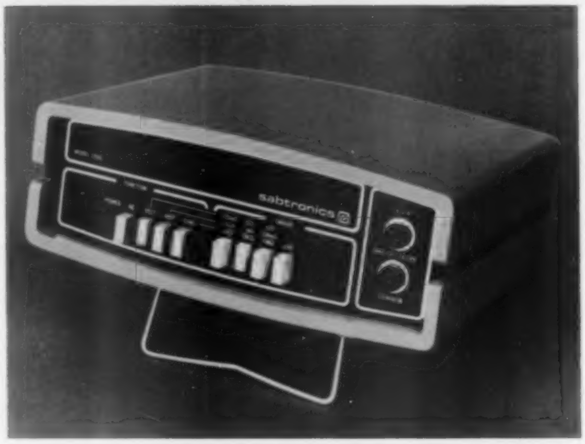

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2.157375
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36.66666
36.66667
37.00000
37.77777
38.00000
38.33333
38.77777
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38.88889
39.00000
39.160
40.00000
41.11111
43.33333
48.97222
49.95
50.14166
53.45

# FREQUENCY COUNTER KIT

**Outstanding Performance**

**Incredible Price** $89.95

**CT-50**

The CT-50 is a versatile and precision frequency counter which will measure frequencies to 60 mHz and up to 600 mHz with the CT-600 option. Large Scale Integration, CMOS circuitry and solid state display technology have enabled this counter to match performance found in units selling for over three times as much. Low power consumption (typically 300-400 ma) makes the CT-50 ideal for portable battery operation. Features of the CT-50 include: large 8 digit LED display, RF shielded all metal case, easy pushbutton operation, automatic decimal point, fully socketed IC chips and input protection to 50 volts to insure against accidental burnout or overload. And, the best feature of all is the easy assembly. Clear, step by step instructions guide you to a finished unit you can rely on.

**Order your today!**

**SPECIFICATIONS:**

Frequency range: 6 Hz to 65 mHz, 600 mHz with CT-600
Resolution: 10 Hz @ 0.1 sec gate, 1 Hz @ 1 sec gate
Readout: 8 digit, 0.4" high LED, direct readout in mHz
Accuracy: adjustable to 0.5 ppm
Stability: 2.0 ppm over 10° to 40° C, temperature compensated
Input: BNC, 1 megohm, 20 pf direct, 50 ohm with CT-600
Overload: 50VAC maximum, all modes
Sensitivity: less than 25 mv to 65 mHz, 50-150 mv to 600 mHz
Power: 110 VAC 5 Watts or 12 VDC @ 400 ma
Size: 6" x 4" x 2", high quality aluminum case, 2 lbs
ICS: 13 units, all socketed

| | |
|---|---|
| CT-50, 60 mHz counter kit | $89.95 |
| CT-50WT, 60 mHz counter, wired and tested | 159.95 |
| CT-600, 600 mHz scaler option, add | 29.95 |
| CB-1 Color TV calibrator-stabilizer | $14.95 |
| DP-1 DC probe, general purpose probe | 12.95 |
| HP-1 High impedance probe, non-loading | 15.95 |

## CAR CLOCK

**The UN-KIT, only 5 solder connections**

Here's a super looking, rugged and accurate auto clock, which is a snap to build and install. Clock movement is completely assembled—you only solder 3 wires and 2 switches, takes about 15 minutes! Display is bright green with automatic brightness control photocell—assures you of a highly readable display, day or night. Comes in a satin finish anodized aluminum case which can be attached 5 different ways using 2 sided tape. Choice of silver, black or gold case (specify).

| | |
|---|---|
| DC-3 kit, 12 hour format | $22.95 |
| DC-3 wired and tested | $29.95 |
| 110V AC adapter | $5.95 |

## Under dash car clock

12/24 hour clock in a beautiful plastic case features: 6 jumbo RED LEDS, high accuracy (1min/mo.), easy 3 wire hookup, display blanks with ignition, and super instructions. Optional dimmer automatically adjusts display to ambient light level.

| | |
|---|---|
| DC-11 clock with mtg. bracket | $27.95 |
| DM-1 dimmer adapter | 2.50 |

## PRESCALER

Extend the range of your counter to 600 mHz. Works with any counter. Includes 2 transistor pre-amp to give super sens, typically 20 mv at 150 mHz. Specify ÷ 10 or ÷ 100 ratio.

| | |
|---|---|
| PS-1B, 600 mHz prescaler | $59.95 |
| PS-1BK, 600 mHz prescaler kit | 49.95 |

## OP-AMP SPECIAL

| | |
|---|---|
| 741 mini dip | 12/$2.00 |
| B1-FET mini dip, 741 type | 10/$2.00 |

## VIDEO TERMINAL

A completely self-contained, stand alone video terminal card. Requires only an ASCII keyboard and TV set to become a complete terminal unit. Two units available, common features are: single 5V supply, XTAL controlled sync and baud rates (to 9600), complete computer and keyboard control of cursor. Parity error control and display. Accepts and generates serial ASCII plus parallel keyboard input. The 3216 is 32 char. by 16 lines, 2 pages with memory dump feature. The 6416 is 64 char. by 16 lines, with scrolling, upper and lower case (optional) and has RS-232 and 20ma loop interfaces on board. Kits include sockets and complete documentation.

| | |
|---|---|
| RE 3216, terminal card | $149.95 |
| RE 6416, terminal card | 189.95 |
| Lower Case option, 6416 only | 13.95 |
| Power Supply Kit | 14.95 |
| Video/RF Modulator, VD-1 | 6.95 |
| Assembled, tested units, add | 60.00 |

## CALENDAR ALARM CLOCK

The clock that's got it all. 6-.5" LEDs, 12/24 hour, snooze, 24 hour alarm, 4 year calendar, battery backup, and lots more. The super 7001 chip is used. Size: 5x4x2 inches.
Complete kit, less case (not available)

| | |
|---|---|
| DC-9 | $34.95 |

## 30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 in for 15 out, 4 W in for 30 out. Max. output of 35 W, incredible value, complete with all parts, less case and T-R relay.

| | |
|---|---|
| PA-1, 30 W pwr amp kit | $22.95 |
| TR-1, RF sensed T-R relay kit | 6.95 |

## FM MINI MIKE KIT

A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

| | |
|---|---|
| FM-3 kit | $12.95 |
| FM-3 wired and tested | 16.95 |

## CLOCK KITS

**our Best Seller**
**your Best Deal**

Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, bronze, black, blue (specify).

| | |
|---|---|
| Clock kit, 12/24 hour, DC-5 | $22.95 |
| Clock with 10 min. ID timer, 12/24 hour, DC-10 | 27.95 |
| Alarm clock, 12 hour only, DC-8 | 24.95 |
| 12V DC car clock, DC-7 | 27.95 |

For wired and tested clocks add $10.00 to kit price.

## Hard to find PARTS

| | | | |
|---|---|---|---|
| **LINEAR ICs** | | **REGULATORS** | |
| 301 | $ 35 | 78MG | $1 25 |
| 324 | 1 50 | 723 | 50 |
| 380 | 1 25 | 309K | 85 |
| 380-8 | 75 | 7805 | 85 |
| 555 | 45 | 78L05 | 25 |
| 556 | 85 | 7905 | 1 25 |
| 566 | 1 15 | 7812 | 85 |
| 567 | 1 25 | 7912 | 1 25 |
| 1458 | 50 | 7815 | 85 |
| 3900 | 50 | **TTL ICs** | |
| **CMOS ICs** | | 74S00 | 35 |
| 4011 | 20 | 7447 | 65 |
| 4013 | 35 | 7475 | 50 |
| 4046 | 1 85 | 7490 | 50 |
| 4049 | 40 | 74196TI | 1 35 |
| 4518 | 1 25 | **SPECIAL ICs** | |
| 5369 | 1 75 | 11C90 | 13 50 |
| **TRANSISTORS** | | 10116 | 1 25 |
| 2N3904 type | 10/1 00 | 4511 | 2 00 |
| 2N3906 type | 10/1 00 | 5314 | 2 95 |
| NPN 30W Pwr | 3/1 00 | 5375AB | 2 95 |
| PNP 30W Pwr | 3/1 00 | 7001 | 6 50 |
| 2N3055 | 60 | 4059 - N | 9 00 |
| UJT 2N2646 type | 3/2 00 | 7208 | 17 95 |
| FET MPF102 type | 3/2 00 | **LEDs** | |
| UHF 2N5179 type | 3/2 00 | Jumbo red | 8/1 00 |
| MRF-238 RF | 11 95 | Jumbo green | 6/1 00 |
| **SOCKETS** | | Jumbo yellow | 6/1 00 |
| 8 pin | 10/2 00 | Mini red | 8/1 00 |
| 14 pin | 10/2 00 | Micro red | 8/1 00 |
| 16 pin | 10/2 00 | BiPolar | 75 |
| 24 pin | 4/2 00 | **FERRITE BEADS** | |
| 28 pin | 4/2 00 | With info, specs | 15/1 00 |
| 40 pin | 3/2 00 | 6 hole balun | 5/1 00 |

## Ramsey's famous MINI-KITS

### FM WIRELESS MIKE KIT

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.
FM-1 kit $2.95 FM-2 kit $4.95

### COLOR ORGAN/MUSIC LIGHTS

See music come alive! 3 different lights flicker with music. One light for lows, one for the mid-range and one for the highs. Each channel individually adjustable, and drives up to 300W. Great for parties, band music, nite clubs and more.
Complete kit, ML-1 $7.95

### LED BLINKY KIT

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts.
Complete kit, BL-1 $2.95

### VIDEO MODULATOR KIT

Converts any TV to video monitor. Super stable, tunable over ch. 4-6. Runs on 5-15V, accepts std. video signal. Best unit on the market!
Complete kit, VD-1 $6.95

### TONE DECODER

A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone decoding, tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 $5.95

### WHISPER LIGHT KIT

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Completely self-contained, includes mike, runs on 110VAC, controls up to 300 watts.
Complete kit, WL-1 $6.95

### SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker.
Complete kit, BN-9 $5.95

### POWER SUPPLY KIT

Complete triple regulated power supply provides variable ± 6 to 18 volts at 200 ma and + 5V at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3V @ 1 A and 24 VCT.
Complete kit, PS-3LT $6.95

### SIREN KIT

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.
Complete kit, SM-3 $2.95

**ramsey electronics**
BOX 4072, ROCHESTER, N.Y. 14610

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(716) 271-6487

**TERMS:** Satisfaction guaranteed or money refunded. COD, add $1.50. Minimum order, $6.00. Orders under $10.00, add $.75. Add 5% for postage, insurance, handling. Overseas, add 15%. NY residents, add 7% tax.

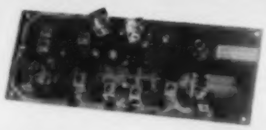
R8

**hamtronics, inc.**

H18 **OSCAR HEADQUARTERS**

**★ Quality VHF & UHF Kits At Affordable Prices**

## SSB TRANSMITTING CONVERTERS



**FEATURES:**

- Linear Converter for SSB, CW, FM, etc.
- A fraction of the price of other units
- 2W p.e.p. output with 1 MW of drive
- Use low power tap on exciter or attenuator pad
- Easy to align with built-in test points

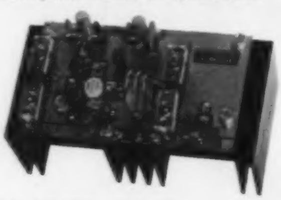
**Frequency Schemes Available:**

| MODEL | INPUT(MHz) | OUTPUT(MHz) |
|---|---|---|
| XV2-1 | 28-30 | 50-52 |
| XV2-2 | 28-30 | 220-222 |
| XV2-3 | 28-30 | 222-224 |
| XV2-4 | 28-30 | 144-146 |
| XV2-5 | 28-29 | 145-146 |
| XV2-6 | 26-28 | 144-146 |

**ONLY $59.95!**

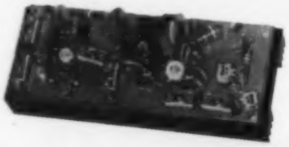
## VHF Linear PA's

- Use as Linear or Class C PA's
- For XV-2 Xmtg Converters, T50 Exciters, or any 2W Exciter



LPA 2-15 Kit $59.95

- 15W out (linear) or 20W (class C)
- Solid State T/R Switching
- Models for 6M, 2M, or 220 MHz



LPA 2-45 Kit $109.95

- 45W out (linear) or 50W (class C)
- Models for 6M or 2M

LPA 8-45 Kit $89.95

For 2M, 8-10W in, 45W out

## T80 UHF POWER AMP

- Broadband PA
- No Tuning Required
- Class C PA
- 430-470 MHz
- 13-15W Out
- 200 mW Drive

Model T80-450
$79.95
Wired & Tested

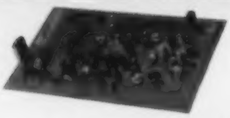
## VHF RECEIVING CONVERTERS

LET YOU RECEIVE OSCAR AND OTHER EXCITING SIGNALS ON YOUR PRESENT HF RECEIVER!

| MODEL | RF RANGE | I-F RANGE |
|---|---|---|
| C28 | 28-32MHz | 144-148MHz |
| C50 | 50-52 | 28-30 |
| C144 | 144-146 | 28-30 |
| C145 | 145-147 | 28-30 |
| C146 | 146-148 | 28-30 |
| C110 | Aircraft | 26-30 |
| C220 | 220-222 | 28-30 |
| C222 | 222-224 | 28-30 |
| Special | Inquire About Other Ranges | |

**ONLY $34.95**

## UHF RECEIVING CONVERTERS



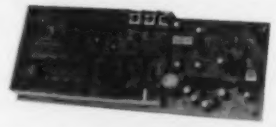
| MODEL | RF RANGE | I-F RANGE |
|---|---|---|
| C432-2 | 432-434 | 28-30MHz |
| C432-4 | 432-436 | 144-146 |
| C432-5 | 435-437 | 28-30 |
| C432-7 | 427.25 | 61.25 |
| C432-9 | 439.25 | 61.25 |
| Special | Inquire About Other Ranges | |

**ONLY $34.95**

A9 Extruded Alum Case with BNC's for above Converters (Optional) ... $12.95

## VHF & UHF FM RECEIVERS

- NEW GENERATION RECEIVERS
- MORE SENSITIVE
- MORE SELECTIVE (70 or 100 dB)
- COMMERCIAL GRADE DESIGN
- EASY TO ALIGN WITH BUILT-IN TEST CKTS
- LOWER OVERALL COST THAN EVER BEFORE



R70 6-channel VHF Receiver Kit for 2M, 6M, 10M, 220 MHz, or com'l bands............ $69.95
Optional xtal filter for 100 dB adj chan 10.00

R90 UHF Receiver Kit for any 2 MHz segment of 380-520 MHz band.................. $89.95

## FAMOUS HAMTRONICS PREAMPS

let you hear the weak ones!

Great for OSCAR, SSB, FM, ATV. Over 10,000 in use throughout the world on all types of receivers.

**P9 Kit $12.95**
**P14 Wired $24.95**

Specify Band When Ordering

- Deluxe vhf model for applications where space permits
- 1-1/2 x 3"
- Models avail to cover any 4 MHz band in the 26-230 MHz range
- 12 Vdc
- 2 stages
- Ideal for OSCAR
- 20 db gain
- Diode transient protection
- Easily tunable

**P8 Kit $10.95**
**P16 Wired $21.95**

Specify Band

- Miniature vhf model for tight spaces – size only 1/2x2-3/8
- Models avail to cover any 4 MHz band in the range 20-230 MHz
- 20 db gain
- 12V

**P15 Kit $18.95**
**P35 Wired $34.95**

- Covers any 6 MHz band in UHF range of 380-520 MHz
- 20 dB gain
- 2 stages
- Low noise

## NEW FM/CW EXCITER KITS

BUILD UP YOUR OWN GEAR FOR MODULAR STATIONS, REPEATERS, & CONTROL LINKS

- Rated for Continuous Duty
- Professional Sounding Audio
- Built-in Testing Aids

T50 Six Channel, 2W Exciter for 2M, 6M, or 220 MHz (Specify band)............... $49.95

T50U Six Channel, 1W Exciter for 430-450 MHz uhf operation .................... $49.95

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PHONE 716-392-9430. (Electronic answering service eves & weekends)

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Add $2.00 shipping & handling.

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**Note New Address and Phone No.**

**hamtronics, inc.**

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## GENERAL INSTRUMENT
FULL WAVE BRIDGE
4 AMP 600 PIV
3/4 IN. SQUARE - WITH LUGS
LOOK!
**75¢ ea. 3 FOR $2** #LM-1

## OP AMP SPECIAL
LM 358. MINI DIP. HOUSE #. WORKS ON SINGLE SUPPLY. A SUPER GEN. PURPOSE DEVICE. SAME AS 1/2 LM 324.
**59¢**

## HEAT SINK
4 x 2¼ x 1
BLACK - FINNED
DRILLED FOR TWO TO-220 CASES.
**$1.29**

## MOTOROLA POWER TRANSISTOR HIGH VOLTAGE
MJE 3439 - PLASTIC POWER CASE
VCEO-350V. 15 WATTS
**2 FOR $1**

## DC PANEL METER
TOP QUALITY.
SMALL SIZE.
500 MA. F.S.
**$2.99 each**

## TRIM POTS
MINIATURE SIZE!
100 K OHMS
**6 FOR $1**

## SUB-MINI PHOTO CELL
ONLY 1/8 IN. DIA. VERY SENSITIVE.
50K OHM-DARK 1K OHM-LIGHT
LIMITED STOCK!
**5 FOR $1**

## 556 DUAL TIMER IC
DUAL 555 TIMER IN ONE DIP
**75¢ EACH 3 FOR $2**

## SONY 30 WATT AUDIO AMP MODULE
#STK-056. 30 WATTS SUPER CLEAN AUDIO. 20 HZ to 100 KHZ ± 2 DB. HYBRID, SILICON, SELF-CONTAINED MODULE. ONLY 1¾ x 2½ INCHES. WITH DATA. COMPARE AT UP TO TWICE OUR PRICE! **$9.99 EACH**

## RCA HAM & GOVERNMENT BAND CONVERTER KIT
LIMITED STOCK
Coverts 134 to 150 MHZ FM to listen on regular AM Band. Complete kit originally designed to sell for about twice our price. Includes PC Board, all parts and pre-punched **aluminum enclosure!** Precision tuning capacitor has coarse and fine control. CLOSE OUT SPECIAL: **$5.99 KIT**

## FILTER CAP
2200 MFD 16WVDC
BY PANASONIC. SMALL SIZE.
FRESH! **3 FOR $1.25**

## FOUR CHANNEL SCANNER
PC Board only. A sensitive two band RECEIVER on a board measuring only 3x2½ In. Units were puchased when HYGAIN closed its Puerto Rico plant. Will scan four crystals on the VHF (high) band or the UHF band. Works off 6VDC. Some units may require slight tuning. We provide basic hook ups, but have no schematic at this time. LIMITED QTY.
**$5.99 each**

## GE NICAD!
**GE Ni-Cad Battery Pack**
3 Cell pack, gives 4 volts at 900MAH. Brand new, factory fresh. Each cell is 2/3 "C" size. **$2.95.**
**Buy 3 packs (12 volts) for $6.95. Limited stock!**

## COMPLEMENTARY POWER TRANSISTORS
SILICON NPN AND PNP. TO-220 CASE.
VCEO - 40V PD - 30 WATTS
FOR AUDIO POWER AMPS, ETC.
TIP29 - NPN
TIP30 - PNP
YOUR CHOICE **3 FOR $1**

## INTERSIL 7107 DVM CHIP
40 PIN IC. MAKES 3½ DIGIT LED VOLTMETER. CAN ALSO BE USED FOR THERMOMETERS, AMP METERS, ETC. WITH DATA.
**$9.95 EACH**

## "THE COLOSSUS" FAIRCHILD SUPER JUMBO LED READOUT
A full .80 inch character. The biggest readout we have ever sold! Super efficient. Compare at up to $2.95 each from others!
FND 847 Common Anode
FND 850 Common Cathode
YOUR CHOICE **$1.49 EA**
**(6 for $6.95)**

## FAIRCHILD PNP "SUPER TRANSISTOR"
2N4402. TO-92 Plastic. Silicon PNP Driver. High Current. VCEO-40 HFE-50 to 150 at 150 MA. FT-150 MHZ. A super "BEEFED—UP" Version of the 2N3906.
**8 FOR $1**

## FAIRCHILD RED LED LAMPS
#FLV5057. Medium Size. Clear Case. RED EMITTING. These are not retested off-spec units as sold by some of our competition. These are factory prime, first quality, new units.
**10 FOR $1.19**
**50 FOR $4.95**
**"WE BOUGHT 250,000 PCS."**

## MINI PROJECT CASE
Black Molded Plastic 2⅞ x 1⅝ x 2 IN. Has open front, with mounting ears so unit can be easily attached to auto dash, etc. Case has molded card guides for mounting PC Board inside. Pefect for digital clocks, car burglar alarms, or almost any electronic project. Can also be used for encapsulating circuits or modules.
**Super Special Purchase!**
**75¢ EACH**

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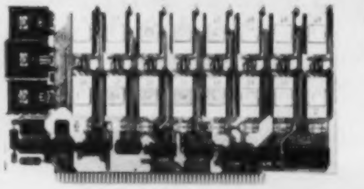
## 16K EPROM CARD-S 100 BUSS



**$59.95**
**KIT**

**OUR BEST SELLING KIT!**

**USES 2708's!**

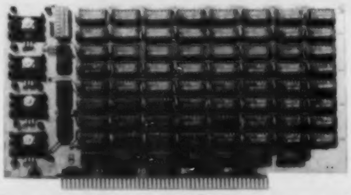
Thousands of personal and business systems around the world use this board with complete satisfaction. Puts 16K of software on line at **ALL TIMES!** Kit features a top quality soldermasked and silk-screened PC board and first run parts and sockets. All parts (except 2708's) are included. Any number of EPROM locations may be disabled to avoid any memory conflicts. Fully buffered and has WAIT STATE capabilities.

**OUR 450NS 2708'S ARE $8.95 EA. WITH PURCHASE OF KIT**

**ASSEMBLED AND FULLY TESTED ADD $25**

## 8K LOW POWER RAM KIT-S 100 BUSS

## 250 NS SALE!



**ADD $5 FOR 250NS!**

**$129 KIT**

**(450 NS RAMS!)**

Thousands of computer systems rely on this rugged, work horse, RAM board. Designed for error-free, NO HASSLE, systems use.

**KIT FEATURES:**

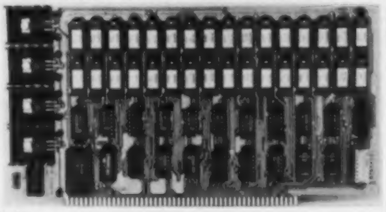
1. Doubled sided PC Board with solder mask and silk screen layout. Gold plated contact fingers.
2. All sockets included.
3. Fully buffered on all address and data lines.
4. Phantom is jumper selectable to pin 67.
5. FOUR 7805 regulators are provided on card.

Blank PC Board w/Documentation **$29.95**
Low Profile Socket Set...**13.50**
Support IC's (TTL & Regulators) **$9.75**
Bypass CAP's (Disc & Tantalums) **$4.50**

**ASSEMBLED AND FULLY BURNED IN ADD $30**

## 16K STATIC RAM KIT-S 100 BUSS

**$295 KIT**



**FULLY STATIC, AT DYNAMIC PRICES**

**WHY THE 2114 RAM CHIP?**

We feel the 2114 will be the next industry standard RAM chip (like the 2102 was). This means price, availability, and quality will all be good! Next, the 2114 is FULLY STATIC! We feel this is the **ONLY** way to go on the S-100 Buss! We've all heard the HORROR stories about some Dynamic Ram Boards having trouble with DMA and FLOPPY DISC DRIVES. Who needs these kinds of problems? And finally, even among other 4K Static RAM's the 2114 stands out! Not all 4K static Rams are created equal! Some of the other 4K's have **clocked** chip enable lines and various timing windows **just as critical** as Dynamic RAM's. Some of our competitor's 16K boards use these "tricky" devices. But not us! The 2114 is the ONLY logical choice for a trouble-free, straightforward design.

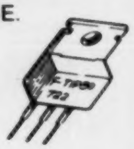
KIT FEATURES:

1. Addressable as four seperate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 2 amps TYPICAL from the +8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA—**$33**
LOW PROFILE SOCKET SET—**$12**
ASSEMBLED & TESTED—**ADD $30**
SUPPORT IC'S & CAPS—**$19.95**
2114 RAM'S—**8 FOR $69.95**

## COMPLEMENTARY POWER TRANSISTORS

SILICON NPN AND PNP. TO-220 CASE.
VCEO - 40V PD - 30 WATTS
FOR AUDIO POWER AMPS, ETC.



TIP29 - NPN
TIP30 - PNP

**YOUR CHOICE**
**3 FOR $1**

## 16K DYNAMIC RAM CHIP

16K X 1 Bits. 16 Pin Package. Same as Mostek 4116-4. 250 NS access. 410 NS cycle time. Our best price yet for this state of the art RAM. 32K and 64K RAM boards using this chip are readily available. These are new, fully guaranteed devices by a major mfg. **VERY LIMITED STOCK!**

**8 FOR $89.95**

**NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE SUPPLIERS OF CPM SOFTWARE.**

**450 NS!**

## 2708 EPROMS

Now full speed! Prime new units from a major U.S. Mfg. 450 N.S. Access time. 1K x 8. Equiv. to 4-1702 A's in one package.

~~$15.75 ea.~~ **$9.95** ~~4 FOR $50.00~~

**PRICE CUT**

**NATIONAL SEMICONDUCTOR** ***NEW!***

## CAR CLOCK MODULE - #MA6008

**$6.99 each**

Originally used by HYGAIN to indicate time and channel on an expensive C.B. Mini size, self contained module. Not a Kit. Four digits plus flashing indicator for seconds. Includes MM5369 and 3.58 MHZ crystal for super accurate time base. With hookup data.

**INCLUDES CRYSTAL TIMEBASE! WORKS ON 12 VDC!**

**MFGR's CLOSEOUT LIMITED QTY.**

## LAB-BENCH VARIABLE POWER SUPPLY KIT

5 to 20 VDC at 1. AMP. Short circuit protected by current limit. Uses IC regulator and 10 AMP Power Darlington. Very good regulation and low ripple. Kit includes PC Board, all parts, large heatsink and shielded transformer. 50 MV. TYP. Regulation.

**$15.99 KIT**

**MALLORY COMPUTER GRADE CAPACITOR**

30,000 MFD 15 WVDC
Small: 3 x 2 Inches
**$1.99 ea. 3 For $4.99**

**New! REAL TIME Computer Clock Chip**

N.S. MM5313. Features BOTH 7 segment and BCD outputs. 28 Pin DIP. **$4.95 with Data**

## Z-80 PROGRAMMING MANUAL

By MOSTEK, or ZILOG. The most detailed explanation ever on the working of the Z-80 CPU CHIPS. At least one full page on each of the 158 Z-80 instructions. A MUST reference manual for any user of the Z-80. 300 pages. Just off the press. **$12.95**

**GENERAL INSTRUMENT**
FULL WAVE BRIDGE
4 AMP 600 PIV
LOOK!
3/4 IN. SQUARE - WITH LUGS

**75¢ ea. 3 FOR $2** #LM-1

**"THE COLOSSUS"**
**FAIRCHILD SUPER JUMBO LED READOUT**

A full .80 inch character. The biggest readout we have ever sold! Super efficient. Compare at up to $2.95 each from others!

YOUR CHOICE
FND 843 Common Anode
FND 850 Common Cathode **$1.49 ea (6 for $6.95)**

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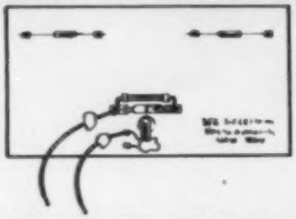
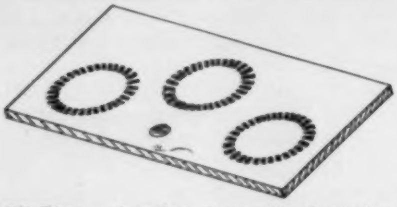
# 85 TON SURPLUS DEAL!!!

170,000 pounds of new surplus electronics was too much for either Digital Research Corporation or Bullet Electronics to handle ALONE! So we pooled our resources and rolled a convoy of four eighteen wheelers into our new Texas warehouse. You may order any of the **below** items from **either** company along with any other items from our respective ads elsewhere in 73. However, please DO NOT order Bullet Kits from Digital Research, or vice-versa.

## TEMPERATURE CONTROLLED HEATING PLATE

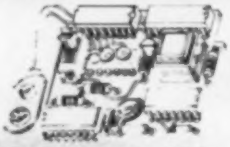


**$2.99**



5⅜ x 10⅜ In. 120 VAC, 120 WATTS. Made of 1/4 In. tempered plate glass with Ni-Chrome heating element laminated to back. Element size is 4¼ x 9¼ Inches. Double protected by TI KLIXON Thermostat and two thermal fuses. Each also has neon ready light.
Besides the obvious use as a bun warmer, food warmer, coffee warmer, glue warmer, etc., our tests show this plate to be an excellent warmer for ferric chloride solution used in etching PC Boards by hobbyists. Typically increases etching efficiency by 300% over room temperature. Non-Submersible.

## CMOS PARTS BONANZA



**99¢** EACH

Complete Module: 2 x 1¾ In.
Contains: MC14553 3 DIGIT BCD COUNTER, MC14511 BCD to 7 segment decoder latch, CD4060 OSCILLATOR and RIPPLE COUNTER, CD4011 Nand gate. Also was square N.O. push button, 9V battery clip, SPDT Sub-Mini slide switch. Plus misc. resistor, caps, transistor. All parts easily removed. Reg. Dist. List on MC14553 alone is over $4 each!

## FIBER POINT PENS

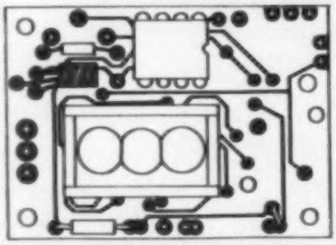
Writes on almost anything. Water Soluble ink. Designed to write on plastic etc. Black. Fine Tip. 49¢ Value.
**SPECIAL: 6/$1 100/$14**

## PUSH BUTTON SWITCH

N.O. SPst. P.C. Mount. Same as used on CMOS Parts Bonanza at left.

**5 FOR $1**

## 4 BIT MICROPROCESSOR MODULE



**75¢** (MODULE ONLY) **3 FOR $2**

Originally custom designed for a large US Consumer Mfg. These were used as part of a weight loss program. Unit counts up to 25 bites with 24 flashes between bites to indicate chewing rate. Has 2 Digit LED readouts, adjustable on board oscillator, 4 Bit Microprocessor with PROM. Our experimentation shows this module has many applications for timing, pacing, etc. Also there are on board signals that can produce various beeping, warble and exotic tones. Some application data included. Complete units in case, as above: **$2.49 each.**

## 74C903 CMOS:

National Semiconductor. New CMOS Part. Hex Inverting Buffer. Use for interface from PMOS to TTL or CMOS. Can Drive LED'S.

**6/$1**

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**sale**

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|---|---|---|
| Harris HA2825 | Phase Lock Loop 14 pin dip | .99 |
| LM340-12 | 12V 1A Regulator Hex # TO-3 | 1.10 |
| SAJ110 | Seven Stage Frequency Divider w/specs | 3/1.00 |
| 50252 | Mostek 6 Digit Chip w/specs 28 pin dip | 1.95 |
| MAN64 | Common Anode Readout Large Character | 6/4.00 |
| FND359 | Common Cathode Readout .4" Character | 6/3.75 |
| FND70 | Common Cathode Readout .3" Character | .50 |
| FND71 | Common Cathode ±1 Character Matches FND70 | .45 |
| TIP-30 | PNP 30W Vceo=40V IC=1A Tab mount TO-220 | 3/1.00 |
| 2N4400 | NPN Gen. Purpose Similar to 2N3904 | 8/1.00 |
| 2N4402 | PNP Compliment to 2N4400 | 8/1.00 |

**UNIVERSAL SOUND EFFECTS BOARD**

New!

HAVE YOU EVER WISHED YOU COULD DUPLICATE THE SOUND OF A STEAM TRAIN OR A PHASOR GUN? HOW ABOUT GUNSHOTS, WHISTLES, SIRENS, BARKING DOGS AND OTHER SOUND EFFECTS? NOW YOU CAN WITH OUR PROGRAMMABLE SOUND EFFECTS KIT. IT USES THE NEW 28 PIN T.I. SOUND SYNTHESYZER CHIP, SN76477 AND SUPPORT CIRCUITRY. 5 TO 12VDC IS REQUIRED TO GIVE APPROX. 1/4 WATT OF AUDIO OUTPUT. WE PROVIDE THE P.C. BOARD, PARTS AND INSTRUCTIONS ALONG WITH A CHART TO PROGRAM SOME COMMON SOUNDS. USE YOUR IMAGINATION TO CREATE ORIGINAL SOUND EFFECTS. ORDER: SE-01 **16.95**(Less Spkr.) 3/39.95

**YOU'VE SEEN IT ON QUALITY STEREO GEAR**

SUPER DEAL!

BLACK INSERT
BRUSHED CHROME
7/8" hole to hole

DPDT Toggle
ALCO CST-682
3A @ 125V

**.49**

**MC1469R POSITIVE VOLTAGE REGULATOR**

½ AMP COMPLETE SPECS AND APPLICATIONS SHOW HOW TO BUILD FIXED OR VARIABLE POWER SUPPLIES FROM 3 TO 30VDC. DRIVE EXTERNAL SERIES PASS FOR CURRENT TO 20 AMPS!

1.25 EA.
10/10.00
HOUSE #

25A
100V
SCR
1.95

Perfect for battery chargers, switching supplies, crowbars, etc.

**739 FAIRCHILD**

DUAL LOW NOISE AUDIO PRE-AMPLIFIER

89¢ 2/1.60

2N5484
N Channel
J-FET
VHF/UHF Amp
to 400MHZ
TO-92
.30

**MPF131 N-CHANNEL DUAL GATE MOSFET**

50¢

DESIGNED FOR AMPLIFIER AND MIXER APPLICATIONS TO 200 MHZ. PLASTIC CASE UNITS ARE HOUSE NUMBERED WITH SPECS.

**MJ900 - MJ1000**

COMPLIMENTARY PNP, NPN **DARLINGTON POWER TRANSISTORS.** 8 AMPS. WE SUPPLY A SCHEMATIC TO BUILD A HIGH POWER (35W) LOW DISTORTION AUDIO AMP WITH ONLY ONE ADDITIONAL TRANSISTOR AND A DOZEN INEXPENSIVE COMPONENTS! TO-3 CASE STYLE. **BUY A PAIR FOR**

$3.00!

**FANTASTIC SOUND EFFECTS CHIP**

THIS 28 PIN MARVEL CONTAINS A LOW FREQUENCY OSCILLATOR, VCO, NOISE OSCILLATOR, ONE SHOT, MIXER AND ENVELOPE CONTROL. WITH 8 PAGE MANUAL. 5 to 9VDC **3.95**

**EMITTER RESISTORS**

HARD TO FIND VALUES!

1 ohm @ 5W

7/1.00

HOUSE #

**LM3900 QUAD NORTON AMP**

WE BOUGHT A LARGE QUANTITY OF THESE HOUSE NUMBERED PARTS AT A BARGAIN PRICE THAT ALLOWS US TO SELL THEM AT A LOW LOW .39¢

**IL-1 OPTO ISOLATORS**

BY LITRONIX 6 PIN DIP STANDARD PINOUT LED-TRANSISTOR COMBINATION.
50¢
WHILE THEY LAST!

**WIREWRAP Wire**

30 Gauge
KYNAR® Insulat.
500 FT
**4.50**

**6 DIGIT ZULU CLOCK KIT**

At last a clock for HAMS. Designed with large bright LED digits to enhance your shack. The unit is a pleasure to assemble and so easy on the budget! You get top quality parts and plated PC Boards. The unique design of the board set eliminates the headaches of running wires between clock and readout board. As a bonus the unit has a switchable timer that can be reset to zero without disturbing real time. Elapsed time in minutes and seconds up to 25 minutes. Six full sized FND510 readouts and colons making viewing easy from across the room. Does NOT use the old style 5314 chip. **DUE TO A SPECIAL PURCHASE WE HAVE A LIMITED QUANTITY.**

*We Promised!*

**COMPLETE ZULU CLOCK KIT**

Includes: All components, plated, drilled PC Boards, large easy to read instructions, and AC transformer. Clock board: 2⅝" X 4⅝". Readout Board 1½" X 4⅝"

16.00
24 Hr. Format Only

Hand made solid hardwood case for the Zulu Clock. Includes ruby front filter and back panel.

6.95

**ALL COMPONENTS 100% GUARANTEED**

| | | |
|---|---|---|
| CA3011 | WIDEBAND IF AMP w/specs | 50¢ |
| 2N3569 | NPN EPOXY 1W | 6/1.00 |
| 741 | OP AMP 8 PIN DIP | 5/1.00 |
| 723 | VOLTAGE REG. 14 PIN DIP | 50¢ |
| MPS6530 | NPN HOUSE # | 5/1.00 |
| 739 | OP AMP LOW NOISE HOUSE # | 89¢ |
| 7815 | 15V 1A REGULATOR HOUSE # | 89¢ |
| 2N4340 | P CHANNEL J FET | 4/1.00 |
| 2N6111 | PNP MED PWR 40W TO-220 | 3/1.00 |
| 2N6028 | PROGRAMMABLE UNIJUNCTION w/specs | 50¢ |
| TRIAC | 200V 8A UNMARKED | 3/1.00 |

***Diodes***

| | | |
|---|---|---|
| 1N4003 | 200V 1A | 15/1.00 |
| 1N4006 | 800V 1A | 12/1.00 |
| 1N270 | Germanium Diode | 8/1.00 |
| 1N38A | Germanium Diode | 10/100 |
| 1N4148 | Cut & Bent for PC Board Insertion | 100/1.25 |

**UNMARKED POWER DIODES** with cathode bands. Guaranteed to be at least 400PIV @ 1A. 100% Good parts. Epoxy case.

25/1.00

**WARBLE ALARM Kit**

A fun EASY kit to assemble that emits an ear piercing 10 watt dual tone scream. Resembles European siren sound. Great for alarms or toys. Operates from 5–12VDC at up to 1 amp (using 12VDC•8 ohm speaker). Over five thousand have been sold. All parts including PC board, less speaker. **2.50** ORDER WB–02

**POWER SUPPLY KIT PS-14**

- Better than 200MV load and line regulation
- Foldback Current Limiting
- Short Circuit Protected
- Thermal Shutdown
- Adjustable Current Limiting
- Less than 1% ripple
- 15 amps 11.5 to 14.9V
- All parts supplied including heavy duty transformer
- Quality plated fiberglass PC board.

Less Case, meters & jacks

UPS SHIPPING PAID!

*REVIEWED IN 7/78 73 MAG.*

15A CONT. 20A INT. 42.95

MV1634 Varicap Diode 10pfd Nom. 2:1 Tuning Range 49¢
2N5583 High Freq. Amp 1 Watt @ 1.5 GHZ! TO-5 Case style, House # 59¢
MFC4000B ¼ Watt Audio Amp 4 pin plastic pack 59¢
H518100 100V 3A SCR Ultra sensitive gate drives from TTL. TO-220 55¢
H8035S 50V 3A Triac Sensitive Gate TO-5 49¢

FND510 69¢
COMMON ANODE READOUT ½" CHARACTER
LIMIT 24 PER CUSTOMER!

| LED'S | | | |
|---|---|---|---|
| JUMBO | RED | 5/.89 | |
| | GREEN | 4/.89 | |
| MEDIUM | RED | .15 | MINI |
| | GREEN | .16 | RED .10 |
| | YELLOW | .16 | |

1.5V 10-30 ma

**MC1351P FM-IF AMP AND DISCRIMINATOR**

USED IN FM & TV SOUND CIRCUITS. REQUIRES MINIMUM EXTERNAL COMPONENTS. 14 PIN DIP. DIRECT REPLACEMENT FOR HEPC 6080, ECG 748 and MANY OTHERS. HOUSE # WITH SPECS 50¢

**MC3301P HOUSE #**

4 OP AMPS IN ONE PACKAGE USES SINGLE SUPPLY (4 to 28VDC) INTERNALLY COMPENSATED. SIMILAR TO MC3401 BUT HIGHER GAIN. 49¢

**OVERVOLTAGE PROTECTION KIT**
**6.95**

Provides cheap insurance for your expensive equipment. Trip voltage is adjustable from 3 to 30 volts. Overvoltage instantly fires a 25A SCR and shorts the output to protect equipment. Should be used on units that are fused. Directly compatible with the PS 12 and PS 14. All electronics supplied. Drilled and plated PC board. (Order OVP 1)

**CAPACITORS**

SMALL SIZE!

2200 MFD @ 16 VDC RADIAL
3/1.00
330 MFD @ 50V Electrolytic
5/1.00 Radial
220 MFD @ 25VDC
7/1.00 AXIAL
1 MFD @ 25VDC DISC CERAMIC
15/1.00

| | | | |
|---|---|---|---|
| .022 | @ | 100VDC Mylar | 8/1.00 |
| .22 | @ | 50VDC Mylar | 6/1.00 |
| 1.5mfd | @ | 400VDC Mylar | 4/1.00 |
| 22mfd | @ | 20V Dip Tant | 4/1.00 |
| 33mfd | @ | 10V Dip Tant | 4/1.00 |

**NEVER A SWEETER METER!**

Beautiful **American made** panel meters are a snap to install. Huge 3½" wide dials are easy to read. You would expect to pay more for each than we get for the pair! MATCHED SET 0-15VDC, 0-30ADC

**12.95** *Set*

**MK-03A CLOCK/TIMER KIT**

Features 24 hour Zulu time and up to 24 hours of elapsed time on the same set of six digit LED readouts. Totally independent operation of both functions. Clock has presettable alarm with 10 minute snooze. Timer has reset, hold, and count functions. Full noise and overvoltage protection. 24 hour only. Readouts has dimmer feature or they can be turned off without disturbing the clock or timer. Timebase included (.01% accuracy). Because of the many options and mounting considerations the case and switches are not included. Switches are standard types. Will fit inside standard aircraft instrument case.

9–14VDC 28.95

***New Items***

| | | |
|---|---|---|
| 72301 | General Purpose Op Amp 8 Lead Can | 3/1.00 |
| 72723 | Volt. Reg. IC (Texas Instruments) 10 Lead Can | .89 |
| 13741 | FET Input 741 Op Amp Hse. # Mini Dip | 3/1.10 |
| 6-36 PFD | Ceramic Trimmer Cap Small & Stable | .45 10/3.80 |
| 30,000 MFD 15 Volts | Computer Grade Cap 3½" height | 2.10 10/18.50 |
| 3.3mfd 6.3VDC | Dip Tantalum (import) Radial Leads | 12/1.00 |

**See You in DAYTON!**

**ZENER GRAB BAG**

A **very** nice assortment of ¼, ½ & 1W zeners. Voltage ranges are from **2.7** to **30 VDC.** Most have house # but we provide a cross over list to standard numbers. A great buy for any shop. **12 different types.**

**50¢**

- NO COD'S
- SEND CHECK OR MONEY ORDER OR CHARGE CARD NO.
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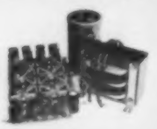

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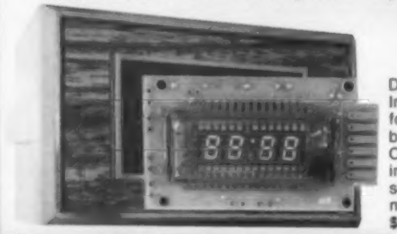

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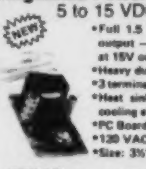

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| CA3035T | 2.48 | CA3086N | .85 |
| CA3039T | 1.35 | CA3089N | 3.75 |
| CA3046N | 1.30 | CA3130T | 1.39 |
| CA3059N | 3.25 | CA3140T | 1.25 |
| CA3060N | 3.25 | CA3160T | 1.25 |
| CA3080T | .85 | CA3401N | .49 |
| CA3081N | 2.00 | CA3600N | 3.50 |

## CALCULATOR CHIPS/DRIVERS

| | |
|---|---|
| MM5725 | $2.95 |
| MM5738 | 2.95 |
| DM8864 | 2.00 |
| DM8865 | 1.00 |
| DM8887 | .75 |
| DM8889 | .75 |
| 9374 7 seg. C.A. LED driver | |

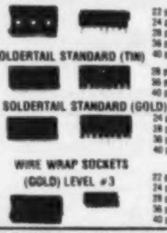
## CLOCK CHIPS

| | |
|---|---|
| MM5309 | $4.95 |
| MM5311 | 4.95 |
| MM5312 | 4.95 |
| MM5314 | 4.95 |
| MM5316 | 6.95 |
| MM5318 | 9.95 |
| MM5369 | 2.95 |
| MM5387/1998A | 4.95 |
| MM5841 | 9.95 |

## MOTOROLA

| | |
|---|---|
| MC1408L7 | $4.95 |
| MC1408L8 | 5.75 |
| MC1439L | 2.95 |
| MC3022P | 2.95 |
| MC3061P | 3.50 |
| MC4016(74416) | 7.50 |
| MC4024P | 3.95 |
| MC4040P | 6.95 |
| MC4044P | 4.50 |

## IC SOLDERTAIL — LOW PROFILE (TIN) SOCKETS



| | 1-24 | 25-49 | 50-100 | | 1-24 | 25-49 | 50-100 |
|---|---|---|---|---|---|---|---|
| 8 pin LP | $.17 | .16 | .15 | 22 pin LP | $ .37 | .36 | .35 |
| 14 pin LP | .20 | .19 | .18 | 24 pin LP | .38 | .37 | .36 |
| 16 pin LP | .22 | .21 | .20 | 28 pin LP | .45 | .44 | .43 |
| 18 pin LP | .29 | .28 | .27 | 36 pin LP | .60 | .59 | .58 |
| 20 pin LP | .34 | .32 | .30 | 40 pin LP | .63 | .62 | .61 |

### SOLDERTAIL STANDARD (TIN)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 14 pin ST | $.27 | .25 | .24 | 28 pin ST | $ .99 | .90 | .81 |
| 16 pin ST | .30 | .27 | .25 | 36 pin ST | 1.39 | 1.26 | 1.15 |
| 18 pin ST | .35 | .32 | .30 | 40 pin ST | 1.59 | 1.45 | 1.30 |
| 24 pin ST | .49 | .45 | .42 | | | | |

### SOLDERTAIL STANDARD (GOLD)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 pin SG | $.30 | .27 | .24 | 24 pin SG | $ .70 | .63 | .57 |
| 14 pin SG | .35 | .32 | .29 | 28 pin SG | 1.10 | 1.00 | .90 |
| 16 pin SG | .38 | .35 | .32 | 36 pin SG | 1.65 | 1.40 | 1.26 |
| 18 pin SG | .52 | .47 | .43 | 40 pin SG | 1.75 | 1.59 | 1.45 |

### WIRE WRAP SOCKETS (GOLD) LEVEL #3

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 pin WW | $.39 | .38 | .31 | 22 pin WW | $ .95 | .85 | .75 |
| 10 pin WW | .45 | .41 | .37 | 24 pin WW | 1.05 | .95 | .85 |
| 14 pin WW | .39 | .38 | .37 | 28 pin WW | 1.40 | 1.25 | 1.10 |
| 16 pin WW | .43 | .42 | .41 | 36 pin WW | 1.59 | 1.45 | 1.30 |
| 18 pin WW | .75 | .68 | .62 | 40 pin WW | 1.75 | 1.55 | 1.40 |

## 1/4 WATT RESISTOR ASSORTMENTS – 5%

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ASST. 1 | 5 ea | 10 OHM<br>27 OHM | 12 OHM<br>33 OHM | 15 OHM<br>39 OHM | 18 OHM<br>47 OHM | 22 OHM<br>56 OHM | 50 PCS | $1.75 |
| ASST. 2 | 5 ea | 68 OHM<br>180 OHM | 82 OHM<br>220 OHM | 100 OHM<br>270 OHM | 120 OHM<br>330 OHM | 150 OHM<br>390 OHM | 50 PCS | 1.75 |
| ASST. 3 | 5 ea | 470 OHM<br>1.2K | 560 OHM<br>1.5K | 680 OHM<br>1.8K | 820 OHM<br>2.2K | 1K<br>2.7K | 50 PCS | 1.75 |
| ASST. 4 | 5 ea | 3.3K<br>8.2K | 3.9K<br>10K | 4.7K<br>12K | 5.6K<br>15K | 6.8K<br>18K | 50 PCS | 1.75 |
| ASST. 5 | 5 ea | 22K<br>56K | 27K<br>68K | 33K<br>82K | 39K<br>100K | 47K<br>120K | 50 PCS | 1.75 |
| ASST. 6 | 5 ea | 150K<br>390K | 180K<br>470K | 220K<br>560K | 270K<br>680K | 330K<br>820K | 50 PCS | 1.75 |
| ASST. 7 | 5 ea | 1M<br>2.7M | 1.2M<br>3.3M | 1.5M<br>3.9M | 1.8M<br>4.7M | 2.2M<br>5.6M | 50 PCS | 1.75 |

**ASST. 8R** Includes Resistor Assortments 1-7 (350 PCS.) **$9.95 ea.**

## TELEPHONE/KEYBOARD CHIPS

| | | |
|---|---|---|
| AY-5-9100 | Push Button Telephone Dialler | $14.95 |
| AY-5-9200 | Repertory Dialler | 14.95 |
| AY-5-9500 | CMOS Clock Generator | 4.95 |
| AY-5-2376 | Keyboard Encoder (88 keys) | 14.95 |
| HD0165 | Keyboard Encoder (16 keys) | 7.95 |
| 74C922 | Keyboard Encoder (16 keys) | 5.95 |

## ICM CHIPS

| | | |
|---|---|---|
| ICM7045 | CMOS Precision Timer | 24.95 |
| ICM7205 | CMOS LED Stopwatch/Timer | 19.95 |
| ICM7207 | Oscillator Controller | 7.50 |
| ICM7208 | Seven Decade Counter | 19.95 |
| ICM7209 | Clock Generator | 6.95 |

## NMOS READ ONLY MEMORIES

| | | |
|---|---|---|
| MCM6571 | 128 X 9 X 7 ASCII Shifted with Greek | 13.50 |
| MCM6574 | 128 X 9 X 7 Math Symbol & Pictures | 13.50 |
| MCM6575 | 128 X 9 X 7 Alphanumeric Control Character Generator | 13.50 |

## MISCELLANEOUS

| | | |
|---|---|---|
| TL074CN | Quad Low Noise bi-fet Op Amp | 2.49 |
| TL494CN | Switching Regulator | 4.49 |
| TL496CP | Single Switching Regulator | 1.75 |
| 11C90 | Divide 10/11 Prescaler | 19.95 |
| 95H90 | Hi-Speed Divide 10/11 Prescaler | 11.95 |
| 4N33 | Photo-Darlington Opto-Isolator | 3.95 |
| MK50240 | Top Octave Freq. Generator | 17.50 |
| DS0026CH | 5Mhz 2-phase MOS clock driver | 3.75 |
| TIL308 | .27" red num. display w/integ. logic chip | 10.50 |
| MM5320 | TV Camera Sync. Generator | 14.95 |
| MM5330 | 4½ Digit DPM Logic Block (Special) | 3.95 |
| LD110/111 | 3½ Digit A/D Converter Set | 25.00/set |

**LITRONIX ISO-LIT 1**
Photo Transistor Opto-Isolator
(Same as MCT 2 or 4N25)
**2/99¢**

**SN 76477**
SOUND GENERATOR
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Low Power - Programmable
**3.95 each**

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AY-3-8500-1 and 2.01 MHZ Crystal (Chip & Crystal includes score display, 6 games and select angles, etc. **7.95/set**

## EXAR

| | | | | | |
|---|---|---|---|---|---|
| XR205 | $8.40 | | | XR2242CP | 1.50 |
| XR210 | 4.40 | | | XR2264 | 4.25 |
| XR215 | 4.40 | | | XR2556 | 3.20 |
| XR320 | 1.55 | JE2206KA | 14.95 | XR2567 | 2.99 |
| XR-L555 | 1.50 | JE2206KB | 19.95 | XR3403 | 1.25 |
| XR555 | .39 | XR1800 | 3.20 | XR4136 | 1.25 |
| XR556 | .99 | XR2206 | 4.40 | XR4151 | 2.85 |
| XR567CP | .99 | XR2207 | 3.85 | XR4194 | 4.95 |
| XR567CT | 1.25 | XR2208 | 5.20 | XR4202 | 3.60 |
| XR1310P | 1.30 | XR2209 | 1.75 | XR4212 | 2.05 |
| XR1468CN | 3.85 | XR2211 | 5.25 | XR4558 | .75 |
| XR1488 | 1.39 | XR2212 | 4.25 | XR4739 | 1.15 |
| XR1489 | 1.39 | XR2240 | 3.45 | XR4741 | 1.47 |

## DIODES

| TYPE | VOLTS | W | PRICE |
|---|---|---|---|
| 1N746 | 3.3 | 400m | 4/1.00 |
| 1N751 | 5.1 | 400m | 4/1.00 |
| 1N752 | 5.6 | 400m | 4/1.00 |
| 1N753 | 6.2 | 400m | 4/1.00 |
| 1N754 | 6.8 | 400m | 4/1.00 |
| 1N757 | 9.0 | 400m | 4/1.00 |
| 1N759 | 12.0 | 400m | 4/1.00 |
| 1N959 | 8.2 | 400m | 4/1.00 |
| 1N965 | 15 | 400m | 4/1.00 |
| 1N5232 | 5.6 | 500m | .28 |
| 1N5234 | 6.2 | 500m | .28 |
| 1N5235 | 6.8 | 500m | .28 |
| 1N5236 | 7.5 | 500m | .28 |
| 1N5242 | 12 | 500m | .28 |
| 1N5245 | 15 | 500m | .28 |
| 1N456 | 25 | 40m | 6/1.00 |
| 1N458 | 150 | 7m | 6/1.00 |
| 1N485A | 180 | 10m | 5/1.00 |
| 1N4001 | 50 PIV 1 AMP | | 12/1.00 |

| TYPE | VOLTS | W | PRICE |
|---|---|---|---|
| 1N4002 | 100 PIV 1 AMP | | 12/1.00 |
| 1N4003 | 200 PIV 1 AMP | | 12/1.00 |
| 1N4004 | 400 PIV 1 AMP | | 12/1.00 |
| 1N4005 | 600 PIV 1 AMP | | 10/1.00 |
| 1N4006 | 800 PIV 1 AMP | | 10/1.00 |
| 1N4007 | 1000 PIV 1 AMP | | 10/1.00 |
| 1N3600 | 50 | 200m | 6/1.00 |
| 1N4148 | 75 | 10m | 15/1.00 |
| 1N4154 | 35 | 10m | 12/1.00 |
| 1N4305 | 75 | 25m | 15/1.00 |
| 1N4734 | 5.6 | 1w | .28 |
| 1N4735 | 6.2 | 1w | .28 |
| 1N4736 | 6.8 | 1w | .28 |
| 1N4738 | 8.2 | 1w | .28 |
| 1N4742 | 12 | 1w | .28 |
| 1N4744 | 15 | 1w | .28 |
| 1N1183 | 50 PIV 35 AMP | | 1.60 |
| 1N1184 | 100 PIV 35 AMP | | 1.70 |
| 1N1185 | 150 PIV 35 AMP | | 1.70 |
| 1N1186 | 200 PIV 35 AMP | | 1.80 |
| 1N1188 | 400 PIV 35 AMP | | 3.00 |

## SCR AND FW BRIDGE RECTIFIERS

| | | | |
|---|---|---|---|
| C36D | 15A @ 400V | SCR(2N1849) | $1.95 |
| C38M | 35A @ 600V | SCR | 1.95 |
| 2N2328 | 1.6A @ 300V | SCR | .50 |
| MDA 980-1 | 12A @ 50V | FW BRIDGE REC. | 1.95 |
| MDA 980-3 | 12A @ 200V | FW BRIDGE REC. | 1.95 |

## TRANSISTORS

| | | | | | |
|---|---|---|---|---|---|
| C106B1 | .50 | | | 2N3904 | 4/1.00 |
| MPSA05 | .30 | 2N3055 | .89 | 2N3905 | 4/1.00 |
| MPSA06 | 5/1.00 | MJE3055 | 1.00 | 2N3906 | 4/1.00 |
| TIS97 | 6/1.00 | 2N3392 | 5/1.00 | 2N4013 | 3/1.00 |
| TIS98 | 6/1.00 | 2N3398 | 5/1.00 | 2N4123 | 6/1.00 |
| 40409 | 1.75 | PN3567 | 3/1.00 | PN4249 | 4/1.00 |
| 40410 | 1.75 | PN3568 | 4/1.00 | PN4250 | 4/1.00 |
| 40673 | 1.75 | PN3569 | 4/1.00 | 2N4400 | 4/1.00 |
| 2N918 | 4/1.00 | MPS3638A | 5/1.00 | 2N4401 | 4/1.00 |
| 2N2219A | 2/1.00 | MPS3702 | 5/1.00 | 2N4402 | 4/1.00 |
| 2N2221A | 4/1.00 | 2N3704 | 5/1.00 | 2N4403 | 4/1.00 |
| 2N2222A | 5/1.00 | MPS3704 | 5/1.00 | 2N4409 | 5/1.00 |
| PN2222 Plastic | 7/1.00 | 2N3705 | 5/1.00 | 2N5086 | 4/1.00 |
| 2N2369 | 5/1.00 | MPS3705 | 5/1.00 | 2N5087 | 4/1.00 |
| 2N2369A | 4/1.00 | 2N3706 | 5/1.00 | 2N5088 | 4/1.00 |
| MPS2369 | 5/1.00 | MPS3706 | 5/1.00 | 2N5089 | 4/1.00 |
| 2N2484 | 4/1.00 | 2N3707 | 5/1.00 | 2N5129 | 5/1.00 |
| 2N2906 | 4/1.00 | 2N3711 | 5/1.00 | PN5134 | 5/1.00 |
| 2N2907 | 5/1.00 | 2N3724A | .65 | PN5138 | 5/1.00 |
| PN2907 Plastic | 7/1.00 | 2N3725A | 1.00 | 2N5139 | 5/1.00 |
| 2N2925 | 5/1.00 | 2N3772 | 2.25 | 2N5210 | 5/1.00 |
| MJE2955 | 1.25 | 2N3823 | 1.00 | 2N5449 | 3/1.00 |
| 2N3053 | 2/1.00 | 2N3903 | 5/1.00 | 2N5951 | 3/1.00 |

## CAPACITOR CORNER

50 VOLT CERAMIC DISC CAPACITORS

| | 1-9 | 10-99 | 100- | | 1-9 | 10-99 | 100- |
|---|---|---|---|---|---|---|---|
| 10 pf | .05 | .04 | .03 | .001µF | .05 | .04 | .035 |
| 22 pf | .05 | .04 | .03 | .0047µF | .05 | .04 | .035 |
| 47 pf | .05 | .04 | .03 | .01µF | .05 | .04 | .035 |
| 100 pf | .05 | .04 | .03 | .022µF | .06 | .05 | .04 |
| 220 pf | .05 | .04 | .03 | .047µF | .06 | .05 | .04 |
| 470 pf | .05 | .04 | .035 | .1µF | .12 | .09 | .075 |
| 100 VOLT MYLAR FILM CAPACITORS | | | | | | | |
| .001mf | .12 | .10 | .07 | .022mf | .13 | .11 | .08 |
| .0022 | .12 | .10 | .07 | .047mf | .21 | .17 | .13 |
| .0047mf | .12 | .10 | .07 | .1mf | .27 | .23 | .17 |
| .01mf | .12 | .10 | .07 | .22mf | .33 | .27 | .22 |
| +20% DIPPED TANTALUMS (SOLID) CAPACITORS | | | | | | | |
| .1/35V | .28 | .23 | .17 | 1.5/35V | .30 | .26 | .21 |
| .15/35V | .28 | .23 | .17 | 2.2/25V | .31 | .27 | .22 |
| .22/35V | .28 | .23 | .17 | 3.3/25V | .31 | .27 | .22 |
| .33/35V | .28 | .23 | .17 | 4.7/25V | .32 | .28 | .23 |
| .47/35V | .28 | .23 | .17 | 6.8/25V | .36 | .31 | .25 |
| .68/35V | .28 | .23 | .17 | 10/25V | .40 | .35 | .29 |
| 1.0/35V | .28 | .23 | .17 | 15/25V | .63 | .50 | .40 |
| MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS | | | | | | | |
| Axial Lead | | | | Radial Lead | | | |
| .47/50V | .15 | .13 | .10 | .47/25V | .15 | .13 | .10 |
| 1.0/50V | .16 | .14 | .11 | .47/50V | .16 | .14 | .11 |
| 3.3/50V | .14 | .12 | .09 | 1.0/16V | .15 | .13 | .10 |
| 4.7/25V | .15 | .13 | .10 | 1.0/25V | .16 | .14 | .11 |
| 10/25V | .15 | .13 | .10 | 1.0/50V | .16 | .14 | .11 |
| 10/50V | .16 | .14 | .12 | 4.7/16V | .15 | .13 | .10 |
| 22/25V | .17 | .15 | .12 | 4.7/25V | .15 | .13 | .10 |
| 22/50V | .24 | .20 | .18 | 4.7/50V | .16 | .14 | .11 |
| 47/25V | .19 | .17 | .15 | 10/16V | .14 | .12 | .09 |
| 47/50V | .25 | .21 | .19 | 10/25V | .15 | .13 | .10 |
| 100/25V | .24 | .20 | .18 | 10/50V | .16 | .14 | .12 |
| 100/50V | .35 | .30 | .28 | 47/50V | .24 | .21 | .19 |
| 220/25V | .32 | .28 | .25 | 100/16V | .19 | .15 | .14 |
| 220/50V | .45 | .41 | .38 | 100/25V | .24 | .20 | .18 |
| 470/25V | .33 | .29 | .27 | 100/50V | .35 | .30 | .28 |
| 1000/16V | .55 | .50 | .45 | 220/16V | .23 | .17 | .16 |
| 2200/16V | .70 | .62 | .55 | 470/25V | .31 | .28 | .26 |

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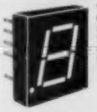

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| ☐ 6 OPTO-COUPLER, 1500V isolation, hobby material, U-test (#2639A) | 1.29 | 12 for 1.30 |
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| ☐ 5 SPST PUSHBUTTON MOMENTARIES, rt. angle, pc mt, on-off (#5435) | 1.29 | 10 for 1.30 |
| ☐ 25 TTL's, with 7400's, U-test, dips (#2418A) | 1.29 | 50 for 1.30 |
| ☐ 30 RADIO AND TV KNOBS, asst styles, sizes (#217) | 1.29 | 60 for 1.30 |
| ☐ 60 TUBULAR CAPACITORS, asst. volts and sizes (#219) | 1.29 | 120 for 1.30 |
| ☐ 55 LOW NOISE RESISTORS ¼, ½W, HIFI, etc (#220) | 1.29 | 110 for 1.30 |
| ☐ 50 POWER RESISTORS, 3, 5, 7 w. axial, pop sizes (#228) | 1.29 | 100 for 1.30 |
| ☐ $25 SURPRISE, all kinds of parts in a pak (#294) | 1.29 | 2 for 1.30 |
| ☐ 12 PANEL SWITCHES, rotary, slide, toggle, etc (#295) | 1.29 | 24 for 1.30 |
| ☐ 60 COILS AND CHOKES, rf, parasitic, If, etc (#297) | 1.29 | 120 for 1.30 |
| ☐ 60 TERMINAL STRIPS, up to 4 solder lugs (#334) | 1.29 | 120 for 1.30 |
| ☐ 60 PRECISION RESISTORS, ½W, 1%, axial (#363) | 1.29 | 120 for 1.30 |
| ☐ 50 MICA CAPACITORS, asst values (#373) | 1.29 | 100 for 1.30 |
| ☐ 10 SETS RCA PLUGS AND JACKS, phono (#402) | 1.29 | 20 for 1.30 |
| ☐ 60 DISC CAPACITORS, asst values long leads (#437) | 1.29 | 120 for 1.30 |
| ☐ 20 TRANSISTOR ELECTRO'S, asst up and ax (#453) | 1.29 | 40 for 1.30 |
| ☐ 75-HALF WATTERS, resistors, color coded, asst (#484) | 1.29 | 150 for 1.30 |
| ☐ 35 SILVER MICAS, red backs, axial, asst. (#488) | 1.29 | 70 for 1.30 |
| ☐ 4-PUSH BUTTON, SPST, PANEL, N.C. 125V @ 1 A (#5289) | 1.29 | 8 for 1.30 |
| ☐ 100 GERMANIUM DIODES, axial leads, u test (#842) | 1.29 | 200 for 1.30 |
| ☐ 100-STABISTORS, Regulator, sensing and computer. Axial, ex. yield (#3140) | 1.29 | 200 for 1.30 |
| ☐ 100 PRINTED CIRCUIT ½ WATT RESISTORS, asst (#1060) | 1.29 | 200 for 1.30 |
| ☐ 12 TRANSISTOR SOCKETS, asst npn and pnp types (#651) | 1.29 | 24 for 1.30 |
| ☐ 50-3 AMP SILICON RECTIFIERS, axial, asst V (#865) | 1.29 | 100 for 1.30 |
| ☐ 50 POLYSTYRENE CAPS, plastic coated, prec. (#1082) | 1.29 | 100 for 1.30 |
| ☐ 10 NE-2 bulbs, for 110vac projects, hobby, etc (#1222) | 1.29 | 20 for 1.30 |
| ☐ 10 PROXIMITY REED SWITCHES (#1258) | 1.29 | 20 for 1.30 |
| ☐ 6 2N918 UHF TO-18 TRANSISTORS (#1423) | 1.29 | 12 for 1.30 |
| ☐ 30 MOLEX CONNECTORS, nylon, asst. sizes (#5642) | 1.29 | 60 for 1.30 |
| ☐ 6-CALCULATOR AC ADAPTOR JACK, standard threads 3 terminals (#2318) | 1.29 | 12 for 1.30 |
| ☐ 50 ONE AMP ZENER DIODES, asst, axial, u test (#1964) | 1.29 | 100 for 1.30 |
| ☐ 5-PA-263 THREE WATT PC BOARDS, for amps (#2012) | 1.29 | 10 for 1.30 |
| ☐ 6 MINI MOTORS, 1½ VDC, for many hobby projects (#2581) | 1.29 | 12 for 1.30 |
| ☐ 50-1N4000 RECTIFIERS, asst to 800V, u test (#2594) | 1.29 | 100 for 1.30 |
| ☐ 20-UPRIGHT ELECTROS, asst'd values & capacitance. (#3226A) | 1.29 | 40 for 1.30 |
| ☐ 1-UHF TUNER, solid state, standard type (#2027) | 1.29 | 2 for 1.30 |
| ☐ 6 ITS A SNAP, 9 VDC BAT-clip, red n black lead (#2852) | 1.29 | 12 for 1.30 |
| ☐ 8 1400 VOLT "RED BALL" RECTIFIERS, axial 1 AMP (#2590) | 1.29 | 16 for 1.30 |
| ☐ 20 1N4148 SWITCHING DIODES, 4 nsec, axial (#3000) | 1.29 | 40 for 1.30 |
| ☐ 6 10 AMP QUADRACS, w/trigger diode up 600V (#3626) | 1.29 | 12 for 1.30 |
| ☐ 5 MICRO SWITCHES, push, asst types (#3011) | 1.29 | 10 for 1.30 |
| ☐ 40 SQUARE DISC STYLE CHOKES, color coded (#3203) | 1.29 | 80 for 1.30 |
| ☐ 30 TRANSISTORS TO92 2N4400 series, u test (#3291) | 1.29 | 60 for 1.30 |
| ☐ 6 TRANSISTORS TRANSFORMERS, audio, inter, etc mini (#3295) | 1.29 | 12 for 1.30 |
| ☐ 15 PRINTED CKT TRIMMER POTS, asst values, etc (#3346) | 1.29 | 30 for 1.30 |
| ☐ 7-2N3055 HOBBY NPN TRANSISTORS, TO-3 (#U3771) | 1.29 | 14 for 1.30 |
| ☐ 10-PNP 30 WATT TO-3 TRANSISTORS, hobby (#3772) | 1.29 | 20 for 1.30 |
| ☐ 50 TUBE SOCKETS, 4, 5, 6, 7 pin tubes, asst (#3830) | 1.29 | 100 for 1.30 |
| ☐ 1-10 AMP POWER TAB QUADRAC, 200 PRV, TO220, 2/trigger (#1590) | 1.29 | 2 for 1.30 |
| ☐ 10-BULLET RECTIFIERS, 1.5 amp, 200V, axial (#84) | 1.29 | 20 for 1.30 |
| ☐ 6-READOUTS, MAN-3, common cath, LED, the claw, RED (#3336) | 1.29 | 12 for 1.30 |
| ☐ 8-LEDS, asst. sizes and shapes, red, green, yellow, amber (#3869) | 1.29 | 16 for 1.30 |
| ☐ PHOTO FLASH ELECTRO. CAP, 600 MF @ 360V (#3897) | 1.29 | 2 for 1.30 |
| ☐ 2-CIRCUIT BREAKERS, glass sealed, axial, rated @ 1 amp (#3905) | 1.29 | 4 for 1.30 |
| ☐ MICRO MINI TOGGLE, SPST, 2 pos, on-off, 125V @ 3 amps (#3936) | 1.29 | 2 for 1.30 |
| ☐ 5 SLIDE VOLUME CONTROLS, asst. of popular values, for HiFi. (#2318) | 1.29 | 10 for 1.30 |
| ☐ 15 COAX LEDs, single lead, pin head style, Color: Red (#1788) | 1.29 | 30 for 1.30 |
| ☐ 60 TERMINAL STRIPS, form two lugs up, Solder type. (#35A334) | 1.29 | 120 for 1.30 |
| ☐ 60 CERAMIC CAPS, incl. NPO's, neg. coef. N750's asst. values. (#35B90) | 1.29 | 120 for 1.30 |
| ☐ 10 TV/FM SPLICERS, for 300 ohm shielded twin lead. Bakelite. (#5547) | 1.29 | 20 for 1.30 |
| ☐ 10-15V ZENERS, 400mw, axial, glass case (#5404) | 1.29 | 20 for 1.30 |

| | | |
|---|---|---|
| ☐ 12-1.5V LAMP AND SOCKET SET, 300ma, T2 style (#3896) | 1.29 | 24 for 1.30 |
| ☐ 10-RCA PHONO JACKS, chassis mount, teflon base (#5119) | 1.29 | 20 for 1.30 |
| ☐ 15-THERMISTORS, asst. types, styles, & values (#2048) | 1.29 | 30 for 1.30 |
| ☐ 4-5-DIGIT 7—SEGMENT READOUTS, in flat pak case (#5616) | 1.29 | 8 for 1.30 |
| ☐ 4-¼" BLOCK TRIM POTS, 5K (#2536) | 1.29 | 8 for 1.30 |
| ☐ 1 "FOTO-FET" N CHANNEL, Crystalonics, J-Sealed Effect Transistors (#1169) | 1.29 | 2 for 1.30 |
| ☐ 1-VOLTAGE REGULATOR, TO202 case, 12V 600MA (#1900) | 1.29 | 2 for 1.30 |
| ☐ 1-3 DIGITS ON A DIP, LED, red, DL-33 (#1887) | 1.29 | 2 for 1.30 |
| ☐ 3-MM5262 2K DYNAMIC RAM, specify type (#3459) | 1.29 | 6 for 1.30 |
| ☐ 10-2N711 HIGH SPEED SWITCHING TRANSISTORS, TO18, npn (#2374) | 1.29 | 20 for 1.30 |
| ☐ 2-15W HI POWER TRANSISTORS, 225V, npn, TO66 (#2787) | 1.29 | 4 for 1.30 |
| ☐ 3-24 PIN IC SOCKETS (#2168) | 1.29 | 6 for 1.30 |
| ☐ 1-MM5312 DIGITAL CLOCK CHIP, 100% (#1525) | 1.29 | 2 for 1.30 |
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| ☐ 1-MM5202 ERASABLE PROM, 100% (#3458) | 1.29 | 2 for 1.30 |
| ☐ 3-10 AMP 25V BRIDGE RECT, comb style (#2447) | 1.29 | 6 for 1.30 |
| ☐ 10-2N3866 RF TRANSISTORS, TO106, 2N5133 (#3372) | 1.29 | 20 for 1.30 |
| ☐ 6-LINEAR SWITCHING TRANSISTORS, 2N2905, pnp, TO5 (#3378) | 1.29 | 12 for 1.30 |
| ☐ 50-2 AMP CYLINDRICAL RECT. up to 1K, u-test (#4006) | 1.29 | 100 for 1.30 |
| ☐ 6 OPEN-FACE READOUTS, LED, red, some segs missing mostly duals (#3952) | 1.29 | 12 for 1.30 |
| ☐ 10-2N2222 (or equiv.), TO-18 metal case (#1962) | 1.29 | 20 for 1.30 |
| ☐ 10-DATA ENTRY SWITCHES, SPST, 1 amp, norm open 125V (#5321) | 1.29 | 20 for 1.30 |
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| ☐ 1-2N5001 80V TRANSISTORS STUD (#2890) | 1.29 | 2 for 1.30 |
| ☐ 3 MICROPROCESSOR/SUPPORT CHIPS, asst. MM5780-90 ser, 24-28pin (#5639A) | 1.29 | 6 for 1.30 |
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| ☐ 1 ALLEN BRADLEY POT, 10K, 2-1 4 watts, type-J, 2" x ¼" shaft (#1748) | 1.29 | 2 for 1.30 |
| ☐ 50 ASST. RED LEDS, 20% or better, various styles and types (#5624) | 1.29 | 100 for 1.30 |
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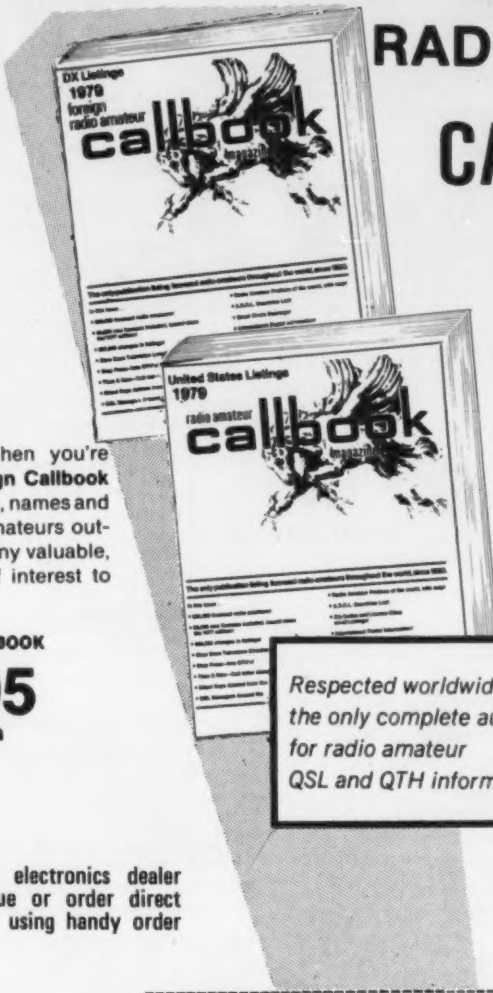

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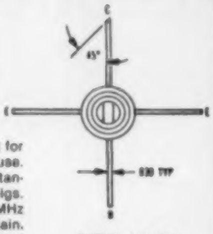
both cases 500 4LFL



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|---|---|---|---|---|
| 2N2876 | 18W | 200 MHz | TO60 | $12.35 |
| 2N3375 | 3.0W | 400 MHz | TO60 | 5.60 |
| 2N3553 | 2.5W | 175 MHz | TO39 | 1.40 |
| 2N3866 | 1.0W | 400 MHz | TO39 | 1.25 |
| 2N3926 | 7.0W | 175 MHz | TO60 | 6.30 |
| 2N4427 | 1.0W | 175 MHz | TO39 | 1.35 |
| 2N5589 | 3.0W | 175 MHz | MT71 | 4.75 |
| 2N5590 | 10W | 175 MHz | MT72 | 7.80 |
| 2N5591 | 25W | 175 MHz | MT72 | 10.25 |
| 2N5913 | 1.75W | 175 MHz | TO39 | 1.70 |
| 2N6080 | 4.0W | 175 MHz | MT72 | 5.40 |
| 2N6081 | 15W | 175 MHz | MT72 | 8.45 |
| 2N6082 | 25W | 175 MHz | MT72 | 10.95 |
| 2N6083 | 30W | 175 MHz | MT72 | 12.30 |
| 2N6084 | 40W | 175 MHz | MT72 | 16.30 |
| 2N6094 | 4.0W | 175 MHz | X106 PNP | 6.60 |
| 2N6095 | 15W | 175 MHz | X106 PNP | 8.50 |
| 2N6096 | 30W | 175 MHz | X106 PNP | 10.35 |
| 2N6097 | 40W | 175 MHz | X106 PNP | 20.00 |

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| 2N5590<br>175 MHz | 10 Watts<br>$5.50 |
| AEC 1272<br>220 MHz | 30 Watts<br>$12.30 |
| AEC 1451<br>50 MHz | 50 Watts<br>$18.10 |

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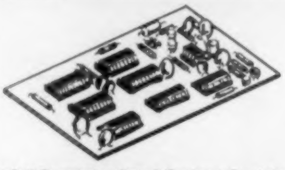

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| QTY. | | | | |
|---|---|---|---|---|
| | 1N914 | 100v | 10mA | .05 |
| | 1N4005 | 600v | 1A | .08 |
| | 1N4007 | 1000v | 1A | .15 |
| | 1N4148 | 75v | 10mA | .05 |
| | 1N4733 | 5.1v | 1 W Zener | .25 |
| | 1N753A | 6.2v | 500 mW Zener | .25 |
| | 1N758A | 10v | " | .25 |
| | 1N759A | 12v | " | .25 |
| | 1N5243 | 13v | " | .25 |
| | 1N5244B | 14v | " | .25 |
| | 1N5245B | 15v | " | .25 |

## SOCKETS/BRIDGES

| QTY. | | | | | |
|---|---|---|---|---|---|
| | 8-pin | pcb | .20 | ww | .35 |
| | 14-pin | pcb | .20 | ww | .40 |
| | 16-pin | pcb | .20 | ww | .40 |
| | 18-pin | pcb | .25 | ww | .95 |
| | 20-pin | pcb | .35 | ww | .95 |
| | 22-pin | pcb | .35 | ww | .95 |
| | 24-pin | pcb | .35 | ww | .95 |
| | 28-pin | pcb | .45 | ww | 1.25 |
| | 40-pin | pcb | .50 | ww | 1.25 |
| | Molex pins | | .01 | To-3 Sockets | .25 |
| | 2 Amp Bridge | | 100-prv | | .95 |
| | 25 Amp Bridge | | 200-prv | | 1.50 |

## TRANSISTORS, LEDS, etc.

| QTY. | | | |
|---|---|---|---|
| | 2N2222 | (2N2222 Plastic .10) | .15 |
| | 2N2222A | | .19 |
| | 2N2907A | PNP | .19 |
| | 2N3906 | PNP (Plastic Unmarked) | .10 |
| | 2N3904 | NPN (Plastic Unmarked) | .10 |
| | 2N3054 | NPN | .45 |
| | 2N3055 | NPN 15A 60v | .60 |
| | T1P125 | PNP Darlington | 1.95 |
| | LED Green, | Red, Clear, Yellow | .15 |
| | D.L.747 | 7 seg 5/8" High com-anode | 1.95 |
| | MAN72 | 7 seg com-anode (Red) | 1.25 |
| | MAN3610 | 7 seg com-anode (Orange) | 1.25 |
| | MAN82A | 7 seg com-anode (Yellow) | 1.25 |
| | MAN74 | 7 seg com-cathode (Red) | 1.50 |
| | FND359 | 7 seg com-cathode (Red) | 1.25 |

## 9000 SERIES

| QTY. | | | QTY. | | |
|---|---|---|---|---|---|
| | 9301 | .85 | | 9322 | .65 |
| | 9309 | .35 | | 9601 | .20 |
| | 9316 | 1.10 | | 9602 | .45 |

## MICRO'S, RAMS, CPU'S, E-PROMS

| QTY. | | | QTY. | | |
|---|---|---|---|---|---|
| | 8T13 | 1.50 | | 2107B-4 | 4.95 |
| | 8T23 | 1.50 | | 2114 | 9.50 |
| | 8T24 | 2.00 | | 2513 | 6.25 |
| | 8T97 | 1.00 | | 2708 | 10.50 |
| | 74S188 | 3.00 | | 2716 D.S. | 34.00 |
| | 1488 | 1.25 | | 2716 (5v) | 59.00 |
| | 1489 | 1.25 | | 2758 (5v) | 23.95 |
| | 1702A | 4.50 | | 3242 | 10.50 |
| | AM 9050 | 4.00 | | 4116 | 11.50 |
| | | | | 6800 | 13.95 |
| | MM 5314 | 3.00 | | 6850 | 7.95 |
| | MM 5316 | 3.50 | | 8080 | 7.50 |
| | MM 5387 | 3.50 | | 8212 | 2.75 |
| | MM 5369 | 2.95 | | 8214 | 4.95 |
| | TR 1602B | 3.95 | | 8216 | 3.50 |
| | UPD 414 | 4.95 | | 8224 | 3.25 |
| | Z 80 A | 22.50 | | 8228 | 6.00 |
| | Z 80 | 17.50 | | 8251 | 7.50 |
| | Z 80 PIO | 10.50 | | 8253 | 18.50 |
| | 2102 | 1.45 | | 8255 | 8.50 |
| | 2102L | 1.75 | | TMS 4044 | 9.95 |

## C MOS

| QTY. | | |
|---|---|---|
| | 4000 | .15 |
| | 4001 | .15 |
| | 4002 | .20 |
| | 4004 | 3.95 |
| | 4006 | .95 |
| | 4007 | .20 |
| | 4008 | .75 |
| | 4009 | .35 |
| | 4010 | .35 |
| | 4011 | .20 |
| | 4012 | .20 |
| | 4013 | .40 |
| | 4014 | .75 |
| | 4015 | .75 |
| | 4016 | .35 |
| | 4017 | .75 |
| | 4018 | .75 |
| | 4019 | .35 |
| | 4020 | .85 |
| | 4021 | .75 |
| | 4022 | .75 |
| | 4023 | .20 |
| | 4024 | .75 |
| | 4025 | .20 |
| | 4026 | 1.95 |
| | 4027 | .35 |
| | 4028 | .75 |
| | 4029 | 1.15 |
| | 4030 | .30 |
| | 4033 | 1.50 |
| | 4034 | 2.45 |
| | 4035 | .75 |
| | 4037 | 1.80 |
| | 4040 | .75 |
| | 4041 | .69 |
| | 4042 | .65 |
| | 4043 | .50 |
| | 4044 | .65 |
| | 4046 | 1.25 |
| | 4048 | .95 |
| | 4049 | .45 |
| | 4050 | .45 |
| | 4052 | .75 |
| | 4053 | .75 |
| | 4066 | .55 |
| | 4069/74C04 | .35 |
| | 4071 | .25 |
| | 4081 | .30 |
| | 4082 | .30 |
| | 4507 | .95 |
| | 4511 | .95 |
| | 4512 | 1.10 |
| | 4515 | 2.95 |
| | 4519 | .85 |
| | 4522 | 1.10 |
| | 4526 | .95 |
| | 4528 | 1.10 |
| | 4529 | .95 |
| | MC14409 | 14.50 |
| | MC14419 | 4.85 |
| | 74C151 | 1.50 |

## LINEARS, REGULATORS, etc.

| QTY. | | | QTY. | | | QTY. | | |
|---|---|---|---|---|---|---|---|---|
| | MCT2 | .95 | | LM323K | 5.95 | | LM380 (8-14 Pin) | 1.19 |
| | 8038 | 3.95 | | LM324 | 1.25 | | LM709 (8-14 Pin) | .35 |
| | LM201 | .75 | | LM339 | .75 | | LM711 | .45 |
| | LM301 | .45 | | 7805 (340T5) | .95 | | LM723 | .40 |
| | LM308 | .65 | | LM340T12 | .95 | | LM725 | 2.50 |
| | LM309H | .65 | | LM340T15 | .95 | | LM739 | 1.50 |
| | LM309K (340K-5) | 1.50 | | LM340T18 | .95 | | LM741 (8-14) | .35 |
| | LM310 | .85 | | LM340T24 | .95 | | LM747 | 1.10 |
| | LM311D | .75 | | LM340K12 | 1.25 | | LM1307 | 1.25 |
| | LM318 | 1.75 | | LM340K15 | 1.25 | | LM1458 | .65 |
| | LM320H6 | .79 | | LM340K18 | 1.25 | | LM3900 | .50 |
| | LM320H15 | .79 | | LM340K24 | 1.25 | | LM75451 | .65 |
| | LM320H24 | .79 | | LM373 | 2.95 | | NE555 | .45 |
| | 7905 (LM320K5) | 1.65 | | LM377 | 3.95 | | NE556 | .85 |
| | LM320K12 | 1.65 | | 78L05 | .75 | | NE565 | .95 |
| | LM320K24 | 1.65 | | 78L12 | .75 | | NE566 | 1.25 |
| | LM320T5 | 1.65 | | 78L15 | .75 | | NE567 | .95 |
| | LM320T12 | 1.65 | | 78M05 | .75 | | | |
| | LM320T15 | 1.65 | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7400 | .10 | | 7482 | .75 | | 74221 | 1.00 | | 74LS02 | .30 |
| | 7401 | .15 | | 7483 | .75 | | 74367 | .95 | | 74LS04 | .30 |
| | 7402 | .15 | | 7485 | .55 | | 75108A | .35 | | 74LS05 | .35 |
| | 7403 | .15 | | 7486 | .25 | | 75491 | .50 | | 74LS08 | .35 |
| | 7404 | .10 | | 7489 | 1.05 | | 75492 | .50 | | 74LS09 | .35 |
| | 7405 | .25 | | 7490 | .45 | | 74H00 | .15 | | 74LS10 | .35 |
| | 7406 | .25 | | 7491 | .70 | | 74H01 | .20 | | 74LS11 | .35 |
| | 7407 | .55 | | 7492 | .45 | | 74H04 | .20 | | 74LS20 | .30 |
| | 7408 | .15 | | 7493 | .35 | | 74H05 | .20 | | 74LS21 | .35 |
| | 7409 | .15 | | 7494 | .75 | | 74H08 | .35 | | 74LS22 | .35 |
| | 7410 | .15 | | 7495 | .60 | | 74H10 | .35 | | 74LS32 | .35 |
| | 7411 | .25 | | 7496 | .80 | | 74H11 | .25 | | 74LS37 | .35 |
| | 7412 | .25 | | 74100 | 1.15 | | 74H15 | .45 | | 74LS38 | .45 |
| | 7413 | .25 | | 74107 | .25 | | 74H20 | .25 | | 74LS40 | .40 |
| | 7414 | .75 | | 74121 | .35 | | 74H21 | .25 | | 74LS42 | .75 |
| | 7416 | .25 | | 74122 | .55 | | 74H22 | .40 | | 74LS51 | .45 |
| | 7417 | .40 | | 74123 | .35 | | 74H30 | .20 | | 74LS74 | .45 |
| | 7420 | .15 | | 74125 | .45 | | 74H40 | .25 | | 74LS76 | .50 |
| | 7426 | .25 | | 74126 | .35 | | 74H50 | .25 | | 74LS86 | .45 |
| | 7427 | .25 | | 74132 | .75 | | 74H51 | .25 | | 74LS90 | .65 |
| | 7430 | .15 | | 74141 | .90 | | 74H52 | .15 | | 74LS93 | .65 |
| | 7432 | .20 | | 74150 | .85 | | 74H53 | .25 | | 74LS107 | .50 |
| | 7437 | .20 | | 74151 | .65 | | 74H55 | .20 | | 74LS123 | 1.20 |
| | 7438 | .20 | | 74153 | .75 | | 74H72 | .35 | | 74LS151 | .85 |
| | 7440 | .20 | | 74154 | .95 | | 74H74 | .35 | | 74LS153 | .85 |
| | 7441 | 1.15 | | 74156 | .70 | | 74H101 | .75 | | 74LS157 | .85 |
| | 7442 | .45 | | 74157 | .65 | | 74H103 | .55 | | 74LS160 | .95 |
| | 7443 | .45 | | 74161 | .55 | | 74H106 | .95 | | 74LS164 | 1.20 |
| | 7444 | .45 | | 74163 | .85 | | 74L00 | .25 | | 74LS193 | 1.05 |
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| | 7470 | .45 | | 74191 | 1.25 | | 74L72 | .45 | | 74S08 | .35 |
| | 7472 | .40 | | 74192 | .75 | | 74L73 | .40 | | 74S10 | .35 |
| | 7473 | .25 | | 74193 | .85 | | 74L74 | .45 | | 74S11 | .35 |
| | 7474 | .30 | | 74194 | .95 | | 74L75 | .85 | | 74S20 | .25 |
| | 7475 | .35 | | 74195 | .95 | | 74L93 | .55 | | 74S40 | .20 |
| | 7476 | .40 | | 74196 | .95 | | 74L123 | .85 | | 74S50 | .20 |
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| | | | | | | | | | | 74S151 | .30 |
| | | | | | | | | | | 74S153 | .35 |
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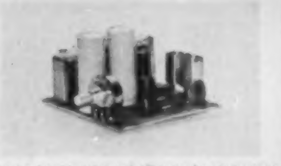

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| VARACTORS | | 2N3638 | 6/$1 | 2N4881 | $2.50 | MM5738N | $2.95 | 748CJ DIP | .35 |
| 1N5139 to<br>1N5144 | $2 | 2N3638A | 5/$1 | 2N4983 | $1 | SN7400N | .18 | 760CJ DIP | 1.00 |
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| F7 432MHz | $2 | 2N3642 | 5/$1 | 2N5087 | 4/$1 | SN7420N | .18 | LM1304B | 1.15 |
| MV830 to<br>MV832 | $1 | 2N3643 | 5/$1 | 2N5089 | 4/$1 | SN7440N | .18 | LM1458N* | 3/$1 |
| MV1620 to<br>MV1634 | $1 | 2N3644 | 4/$1 | 2N5128 to<br>2N5135 | 6/$1 | SN7451N | .18 | LM2111B | $1.40 |
| MV1866 to<br>MV1872 | $2 | 2N3646 | 4/$1 | 2N5138 | 5/$1 | SN7473N | .35 | XR2556CP | 1.55 |
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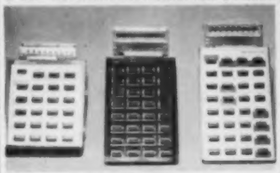

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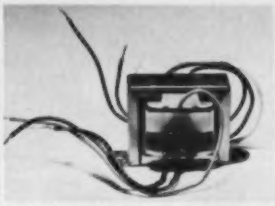

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| 1.0 | 35 | .25 | .20 |
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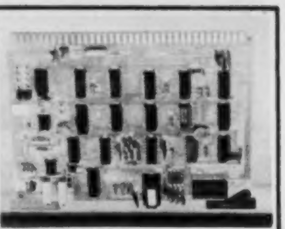

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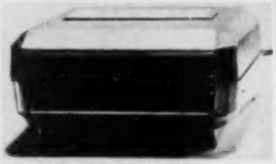

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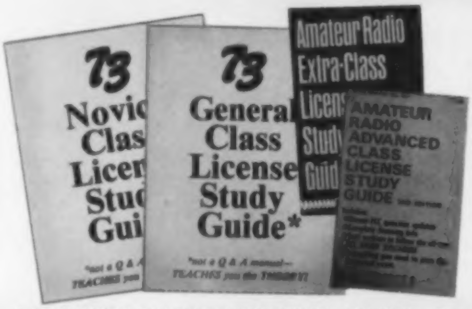

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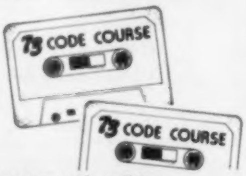

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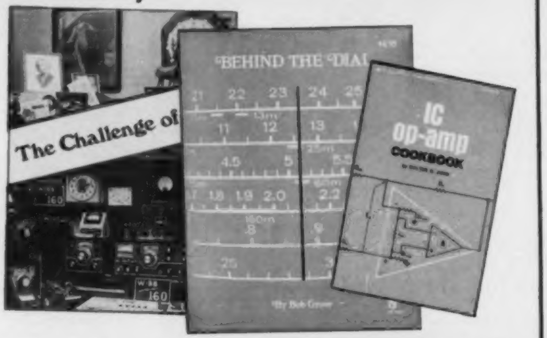

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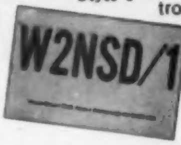

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by
J. H. Nelson

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| EAST COAST | 21 | 14A | 14 | 7 | 7 | 7 | 7A | 14 | 14 | 14A | 14A | 21 |

A = Next higher frequency may also be useful
B = Difficult circuit this period
F = Fair
G = Good
P = Poor
SF = Chance of solar flares

## may

| sun | mon | tue | wed | thu | fri | sat |
|---|---|---|---|---|---|---|
|  |  | 1 G | 2 G | 3 G | 4 G | 5 G |
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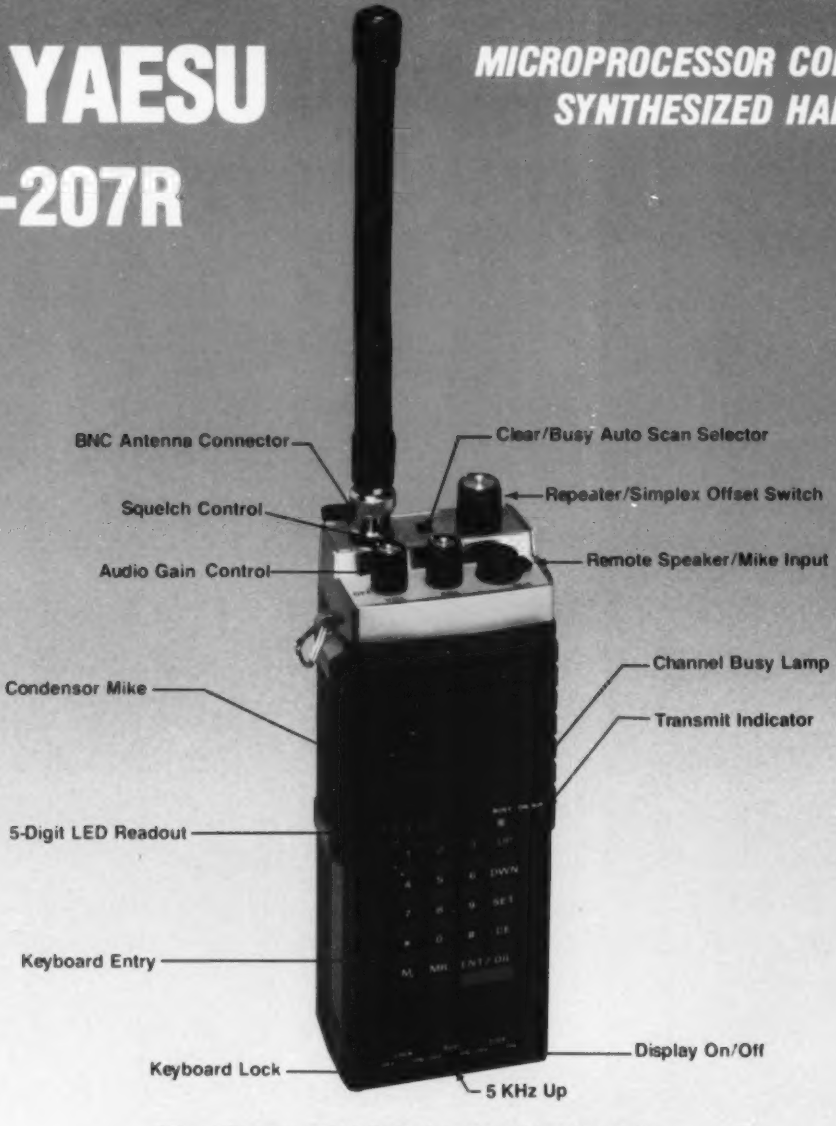

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